Discover.

September 12, 2013

RE: Request for Qualifications: Elm at Elm Point Traffic Flow Improvements

Dear Consultant:

The City of St. Charles is interested in securing professional services for work associated with:

CMAQ-7302(650) Elm at Elm Point Traffic Flow Improvements

The engineering responsibilities may include but are not limited to the following: The preparation of Conceptual plans, Preliminary plans, Contract plans. Design services may include, right of way plans, surveying, geotechnical investigations, public involvement, environmental and historic preservation services/permits, contract documents, assisting with the bidding process, construction support/construction inspection, utility coordination/permits and traffic controls including the preparation of PS&E and final documents.

A location map for these projects, the East-West Gateway TIP applications, and a copy of the scoring criteria that will be used as the basis for selection is attached for your information.

The project goals, basic scope, and other information are described in the attached Project Charter.

The City will supply digital aerial photography and GIS topography to the consultant selected for the project if requested. The consultant will be required to supplement this information with any necessary surveys.

DBE firms must be listed in the MRCC DBE Directory located on MoDOT's website at www.modot.gov, in order to be counted as participation towards an established DBE Goal. We encourage DBE firms to submit letters of interest as prime consultants for any project they feel can be managed by their firm.

Department of Public Works

Engineering Division

City of Saint Charles
200 North Second Street
Saint Charles, MO 63301
636.949.3237
www.stcharlescitymo.gov

It is required that your firm's Statement of Qualification (RSMo 8.285 through 8.291) and an Affidavit of Compliance with the federal work authorization program along with a copy of your firm's E-Verify Memorandum of Understanding (15CSR 60-15.020) be submitted with your firm's Letter of Interest.

RFQ RESPONSE INSTRUCTIONS:

I. Roster Requisite (MUST be included for consideration)

In satisfying ordinance compliance, a copy of the firm's State of Missouri Corporate Certificate of Authority (for each professional service applicable - i.e., Architecture, Professional Engineer, or Land Surveying), a copy of individual professional's State of Missouri Registration Certificate, and a letter of intent to assign an applicable professional (the requisite need not designate the individual) to each project awarded. (Note: If this information has been submitted previously, please indicate the date of submission.

Other Requisite Information:

A. "Subcontracted" Professional Services:

Since it is recognized that some firms do not employ all necessary professional disciplines to accomplish a given project in-house and that those firms commonly "subcontract", those firms intending to do so must forward the earlier noted roster requisite information for all firms which will be performing auxiliary "subcontracted" services. An example might be as follows:

The principle firm (Engineering) employs in-house architects, landscape architects, civil engineers (structural and highway design backgrounds) but intends to "subcontract" for geotechnical (soil analysis) services. Roster requisite information on the "subcontracted" firm(s) must be included.

B. Professional Liability:

The principle firm must submit an indication of existing professional liability (errors and omissions) insurance, or the ability to obtain such insurance, in an amount sufficient to cover the estimated construction cost of the project or $2 million whichever is less.

The principle firm is expected to provide such additional coverage as may be necessary to cover any "subcontracted" services.

II. INITIAL SELECTION FACTOR INFORMATION

The following considerations are intended to be evaluated by the Review Group. The below listings are not in any order of priority.

A. General experience and capabilities in the type of work required:

1. Preparation of construction plans for roadway construction
2. Construction cost efficiency (value engineering)
3. Familiarity with design requirements
4. Professional staff

B. Quality of previous projects performed for the City of St. Charles describing that past project delivery has been:

1. On Time
2. On Budget
3. With Quality

C. Recent Experience:

1. Provide a list of your firm's last five similar projects*.
2. Record of project time – estimate vs. actual for design and construction.
3. Accuracy of construction cost estimates for the previously listed projects. Include the engineers estimate, low bid, and final construction cost.
4. Name of the representative project manager(s) for your firm on each described project.

D. Community Relations:

1. Experience with community relations including evidence of sensitivity to citizen concerns (i.e., reaction to neighboring and concerned citizen comments reflected in design change and/or public explanation, etc.)
2. Explanation of community relations approach for this project

E. Technical Approach:

Describe your firm's technical approach to the project including how your firm can achieve the project goals, deal with the project conditions, and meet the project standards. Include any other project information you may feel is relevant or important for consideration.

F. Current workload and adequate staffing:

1. Provide a list of current projects and their anticipated completion schedules.
2. Provide your firm's anticipated design schedule this project.

G. Quality assurance and control:

Describe methods or procedures your firm has used to provide assurance and control of quality on past projects and include how your firm will achieve quality for this project.

H. Include any other information your firm may feel is pertinent.

* Regarding reference projects, information submitted must include project sponsoring agency name, address, and phone number; and a contact person with phone number (if different than above) is desirable.

Three (3) copies of your RFQ response submittal for this project must be received no later than 2:00 p.m., local time, October 7, 2013. Submittals should be clearly labeled as **Elm at Elm Point Traffic Flow Improvements.**

Submit information to:

Brad Temme, P.E.
Project Manager
City of St. Charles
200 North Second Street, Room 202
St. Charles, MO 63301

We thank you for your interest in this project and should you have any questions, please feel free to contact me at 636-940-4617, via email at brad.temme@stcharlescitymo.gov.

Sincerely,

Brad Temme, P.E.
Project Manager

Cc: Kevin Corwin, P.E., PLS, City Engineer
Eric Allmon, P.E., Sr. Project Manager – Design

Enclosures:
Project Location Map
East West Gateway TIP Application
Project Charter
Scoring Criteria for Selection

City of St. Charles, St. Charles County, Elm Street and Elm Point Industrial Drive	
Federal Aid No.:	CMAQ-7302(650)
Location:	Elm at Elm Point Northbound and Eastbound Approaches
Proposed Improvement:	Roadway, Traffic Signals, ADA
Length:	0.10 miles
Approximate Construction Cost:	*$400,000*
DBE Goal Determination	*16%*
Consultant Services Required:	The engineering responsibilities may include but are not limited to the following: The preparation of Preliminary plans, and Contract plans. Design services may include, right of way plans, surveying, geotechnical investigations, public involvement, environmental and historic preservation services/permits, contract documents, assisting with the bidding process, construction support/construction inspection, utility coordination/permits and traffic controls including the preparation of PS&E and final documents.
Other Comments:	
Contact:	Brad Temme, P.E. Project Manager City of St. Charles 200 North Second Street, Room 202 St. Charles, MO 63301 Phone: 636-940-4617 Email: brad.temme@stcharlescitymo.gov
Deadline:	*2:00 pm, October 7, 2013*

Submit

- Statement of Qualifications
- Affidavit of Compliance with the federal work authorization program
- E-Verify Memorandum of Understanding

Public Works Department
Project Charter

Project Name: Elm Point Industrial Drive and Elm Street Traffic Flow Improvements
Department: Public Works
Division: Engineering
Project Number: C13STREETS046 CMAQ-7302(650)
Account Number: 410-500-501-873-111
412-500-501-873-111

Prepared By

Document Owner(s)	Project/Organization Role
Brad Temme	Project Manager

Project Charter/PMP Version Control

Version	Date	Author	Change Description
Charter V1	8/27/13	BWT	• Initial Charter Creation

Online Project Plan

Status	Date	Author	Details
Planning	8/27/13	BWT	• ProjectManager.com setup

TABLE OF CONTENTS

1 PROJECT CHARTER/PMP PURPOSE

The project charter defines the vision, goals, scope, objectives, constraints, and overall approach for the work to be completed as part of this project. It is a critical element for initiating, planning, executing, controlling, and assessing the project. In addition, it serves as an agreement between the Project Team stating what will be delivered according to the budget, time constraints, risks, resources, and standards agreed upon for the project.

2 PROJECT PURPOSE AND OVERVIEW

The project will make traffic flow improvements to the northbound and eastbound approaches at the intersection of Elm Street with Elm Point Industrial Drive. These improvements will increase the level of service at the intersection.

3 PROJECT TEAM

Project Team Role	Project Team Member(s)	Contact Information
Project Manager (City of St. Charles)	Brad Temme	636-940-4617 brad.temme@stcharlescitymo.gov
Senior Project Manager (City of St. Charles)	Eric Allmon	636-949-3353 eric.allmon@stcharlescitymo.gov
City Engineer (City of St. Charles)	Kevin Corwin	636-949-3237 kevin.corwin@stcharlescitymo.gov
Sr. Project Manager - Construction (City)	Steve Noonan	636-949-3237 stephen.noonan@stcharlescitymo.gov
Right of Way Specialist	Brian Faust	636-949-3245 brian.faust@stcharlescitymo.gov
Design Consultant	TBD	

3.1 [PMP – Organizational Chart]

Attach Org. Chart Exhibit

3.2 [PMP – Communications Plan]

Attach and/or specify online

4 PROJECT SCOPE STATEMENT

4.1 Goals and Objectives

Goals	Objectives
Improve Traffic Flow	• Add a second eastbound left turn lane • Add a second northbound through lane
ADA Compliant Facilities	• Sidewalks will be reconstructed to maintain ADA accessibility

4.2 Statements of Work (SOW)

SOW	Owner/Prime	Due Date/Sequence
MoDOT Consultant Solicitation	Temme	9/2/2013
Select Consultant	Temme	12/3/2013
Program Agreement	Temme	12/2/2013
MoDOT Design Contract Approval	Temme	1/28/2014
Preliminary Plan	Consultant	5/7/2014
MoDOT Preliminary Plan Approval	Consultant	5/28/2014
Right of Way Plan	Consultant	6/17/2014
MoDOT Right of Way Plan Approval	Consultant	7/24/2014
MoDOT A-Date	Consultant	7/24/2014
Right of Way Acquisition	Faust	2/25/2015
Final PS&E	Consultant	3/17/2015
MoDOT Final PS&E Approval	Consultant	4/28/2015
Bid	Temme	6/9/2015
Construction	Noonan	12/10/2015
Final Close Out	Noonan	1/28/2016

4.3 Milestones and Deliverables

Milestone	Deliverable
1. Program Agreement	• Executed MoDOT Program Agreement
2. Consultant Contract	• Executed Contract
3. MoDOT Consultant Contract Approval	• Federal Obligation of Design Funding
4. Preliminary PS&E	• Preliminary Plans

Submittal	• Preliminary Estimate
5. Preliminary Plan Approval	• MoDOT Preliminary Plan Approval
6. Environmental Classification	• Approved Environmental Clearance
7. 106 Clearance	• Approved 106 Clearance
8. Utility Relocation Plan Approval	• Utility Relocation Plan • Approval Letter • Estimate
9. Right of Way Plan Submittal	• Right of Way Plans • Estimate
10. Right of Way Plan Approval	• A-date
11. Right of Way Acquisition	• Right of Way Clearance
12. Final Plan Submittal	• Final Plans • Final Specifications • Final Estimate
13. Final Plan Approval	• Federal Obligation of Construction Funding and Authority to Advertise for Bids
14. Bid	• Sealed Bids from Contractors
15. MoDOT Concurrence in Award	• MoDOT Concurrence in Award and Federal Obligation of the Construction Contract
16. Begin Construction	• Executed Construction Contracts
17. Final Acceptance	• Lien Waivers, Final Invoice
18. Final Project Approval	• Final Reimbursement Check

4.4 Out of Scope

The project will not include a new traffic study or concept plan. The project concept is defined in the 2010 Traffic Study.

4.5 Project Funding

Source	FY 2014	FY 2015	FY2016	Confidence Level
City	$18,000	$80,000	$	High
CMAQ	$72,000	$320,000	$	High

4.6 [PMP – Work Breakdown Structure]

Specified online.
Attach Executed Contracts

4.7 [PMP – Time Management Plan]

Managed online. Schedule shall be updated as frequently as weekly

4.8 [PMP – Cost Management Plan]

Cost estimates shall be stored online and provided at completion of the following tasks: Preliminary Plan, Right of Way Plan, and Final Plans

4.9 [PMP – Change Management Plan]

Managed online.

5 PROJECT CONDITIONS

If an online project plan has already been created, issues and risks can be entered online with a printed summary attached to the project charter/PMP.

5.1 Issues List

#	Description	Impact*	Priority*	Owner	Proposed Resolution
1	Federal funding requirements	Low	High	City	Project must be completed to the standards set forth in MoDOT's LPA Manual.
2	ROW Acquisition	Medium	Medium	City	If condemnation is required to acquire property the project timeline may be extended.
3	District 6 Traffic Approval	Low	Medium	City/Consultant	Coordination throughout the project will be necessary to ensure our work will meet MoDOT standards.
4	Utility Relocations	Medium	High	City/Consultant	Following the County Utility Coordination plan will be necessary to minimize their impact.

5.2 Risk Register

#	Description	Impact*	Likelihood*	Owner	Proposed Mitigation
1	MoDOT does not grant or is	High	Medium	City/Consultant	Communication with the MoDOT Local Roads department throughout the

#	Description	Impact*	Likelihood*	Owner	Proposed Mitigation
	slow with plan approvals				design process should help to minimize the chances of this occurring
2	ROW acquisition delays	Medium	Low	City/Consultant	Coordination throughout the project with adjacent property owners will be necessary to ensure they are on board with the proposed improvements.
3	Meeting MoDOT deadlines	High	Low	City/Consultant	Project schedule management will be necessary to ensure all deadlines are met.
4	Utilities relocation delays	High	Low	City/Consultant	Meet with utilities early on and incorporate their needs into the preliminary overall design.

***Risk and Issue Criteria:**

Description	Impact	Priority	Likelihood
High	occurrence will have a substantial impact on the progress or result of the project	requires immediate follow-up and resolution	very likely to occur
Medium	occurrence will have an impact on the progress or result of the project, but within reasonable tolerances	requires follow-up before completion of next project milestone	may occur
Low	occurrence will have only minor impacts on the progress or result of the project	requires resolution prior to project completion	probably will not occur

5.3 Stakeholder Input Summary

Name	Organization	Role	Interests
Adjacent Property Owners	Owners of property adjacent to project	ROW and easements will need to be acquired from these people	Receiving fair compensation for any ROW or easement needed on their property.
City Council Members	City	Represent the citizens of the City.	An on time and on budget project.
Utility	Utilities	Relocate their	Protecting their financial

Name	Organization	Role	Interests
Companies		utilities at lowest possible cost	interests and preserving their rights.
MoDOT	MoDOT	Recommends Federal Fund Obligation.	A project that meets the original scope and is on time and on budget.

5.4 [PMP – Issue and Risk Management Plan]

Managed online

6 PROJECT STANDARDS

6.1 Standards

- MoDOT LPA Manual
- ADAAG
- St. Louis County Standard Plans and Specifications for Highway Construction
- MUTCD
- AASHTO "A Policy on Geometric Design of Highways and Streets"

6.2 Permits/Outside Approvals

- MoDOT Environmental Clearance
- SHPO 106 Permit
- DNR Land Disturbance Permit

6.3 Notes

- The 2010 Traffic Study by CBB will be attached to this document.

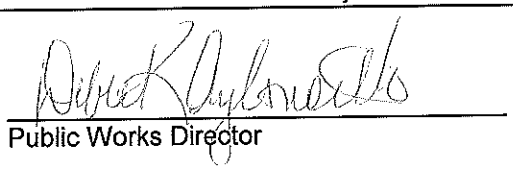
7 APPROVALS

Prepared by _____
Project Manager

Approved by _____
Consultant

_____
Design Sr. Project Manager

_____
City Engineer



Public Works Director

8 APPENDICES

8.1 Project Map

8.2 Project Organization Chart

8.3 Project Communications Plan

8.4 Default Project Reports

8.4.1 Status Report

(Generated Online)

8.4.2 Milestone Report

8.4.3 Cost Report

8.5 Executed Consultant Contract(s)

Discover.

Public Works Department
Project Communication Plan

Elm at Elm Point Traffic Flow Improvement Project
C13STREETS046 CMAQ-7302(650)

Last Updated: 8/29/2013

Planning Stakeholder Input

In preparing the project event and document communication tables below as well as performing the planning of individual communication events, the project team should always account for the following ten considerations:

1. Event – Identify the events or occasions that will be planned/held to receive stakeholder input
2. People – Identify the individuals who will be considered stakeholders and invited to offer feedback
3. Need – Identify the level of need for stakeholder input – is it just internal City Commissions, Boards, Committees, Council, etc. or should it include other public groups? Are there other individual stakeholders such as regulatory officials or critically impacted property owners and/or businesses?
4. Information – Identify the information that will need to be communicated for stakeholders
5. Format – Identify how information will be communicated (e.g., presentations, mailings, meeting, etc.), the arrangement of meeting spaces (audience, round-table, etc.), and event accessories (food, soda, audio/visual, etc.)
6. Dates/Frequency – Identify the dates and/or frequency with which communication will take place
7. Notice – Identify how notice will be given to stakeholders (i.e., how the word will be spread)
8. Feedback – Identify how stakeholder feedback will be received and collected
9. Summary – Identify who will be responsible for summarizing stakeholder input and how they are to summarize it
10. Sharing – Identify who will receive stakeholder input summaries and how they will receive it

Each stakeholder event should be planned individually with event planning sheet at the end of the Communication Plan. Completed planning sheets should be attached to the Communication Plan for reference.

Project Events Communication

Project Events Communication Table

Event	Members	Event Format and Critical Information	Schedule / Frequency
Initiation/Planning Stakeholder Input*	Consultant, Brad Temme, Eric Allmon, Kevin Corwin, Debra Aylsworth, Brian Faust (TEAM)	Scoping Meeting to discuss the objectives and deliverables for the project	Once / During Contract negotiation
Kick-Off Meeting	Consultant, TEAM	Meeting following PMM Standard 9.9 Agenda	Once / After Council approves negotiated contract
Initial Site Assessment	Consultant, TEAM	On-site	Once / After Kick-Off Meeting
Risk and Issue Alerts (add necessary "clients" to PM.com)	Consultant, TEAM, Council	Online PM.com tracking during project development	Ongoing / As needed
Project Progress Updates	Consultant, TEAM	Online PM.com tracking	Monthly
Progress Meetings	Consultant, TEAM	Meeting at City Hall to discuss major issues	As needed for the major milestones tracked on PM.com
Public Meeting(s)*	Consultant, TEAM, Public, Council	Open House meeting with Public	Prior to approved right of way plans
Specialized Stakeholder Meeting(s)*	N/A	N/A	None
Utility Coordination Meeting(s)	Consultant, Brad Temme, Eric Allmon, Kevin Corwin, Utility Companies	Meeting at City Hall to discuss impacts	Tracked online on PM.com / At least one meeting to possibly three meetings
Field Check Meeting(s)	Consultant, Brad Temme, Construction Inspector, Steve Noonan, Kevin Corwin, Eric Allmon	Field meeting to view project plans and existing conditions	Tracked online on PM.com / throughout design and prior to construction
Construction Start Notice	Construction Inspector, Contractor, property owners	Meeting at City Hall, Flyers	After Council approval of construction contract
Construction Traffic Notices	Construction Inspector, Contractor, Stephen Noonan, Kevin Corwin	PM.com, Internet and Public Announcements, Changeable Message Boards	Ongoing / As needed
Construction Progress Updates	Construction Inspector, Contractor, Stephen Noonan, Kevin Corwin, Public	PM.com, Internet and Public Announcements	Monthly
Construction Emergency Notice	Construction Inspector, Kevin Corwin, John Zimmerman, Stephen Noonan	Phone, Internet, and Public Announcements	As needed / Anticipated

Official Ceremonies (Ground Breaking, Ribbon Cutting, etc.)*	N/A	N/A	None

* Separate sheets must be attached describing the details and responsible parties for planning this event.

Project Documents Communication

Project Documents Communication Table

Document	Recipients	Responsible Party	Distribution Method
Project Charter	Consultant, TEAM	Brad Temme	Delivered at Initiation Meeting
Requests for Qualifications	Consultants, TEAM	Brad Temme	Deliver through mail service / Advertisement
Engineering Services Contract	Consultant, Clerks Office, Brad Temme, Street Committee, City Council	Brad Temme	Hard copies routed after signatures
Project schedule and updates	Consultant, TEAM , PM.com authorized users	Brad Temme	Online PM.com updates
Project Progress/Status Reports	Consultant, TEAM	Brad Temme, Construction Inspector	Email
Progress Meeting Minutes	Consultant, TEAM	Consultant	Email / Online PM.com upload
Public Meeting Minutes	Consultant, TEAM	Consultant, Brad Temme	Email / Online PM.com upload
Stakeholder Input Summaries	TEAM	Brad Temme	Email
Data Sharing (incl. related studies)	Consultant	Brad Temme, Consultant	Hard copy / PM.com upload
Alternatives Analysis / Concept Plans	TEAM, Consultant, Street Committee	Consultant	Hard copy / PM.com upload
Survey(s)	Brad Temme, Utility Companies	Consultant	Hard copy / PM.com upload
Preliminary PS&E/Study	Brad Temme, Utility Companies	Consultant	Hard copy / PM.com upload
Right-of-Way Plans/Docs	Brad Temme, Brian Faust, Utility Companies	Consultant	Hard copy / PM.com upload
Appraisals and/or Review Appraisals	Brian Faust, MoDOT	Brian Faust	Hard copy
Initial Offer Letters	Property Owners	Brian Faust	Hard copy / PM.com upload
Parcel Acquisition Status Reports	TEAM	Brian Faust	Email / Council RCA
Permit Applications	Brad Temme, Permit Agencies	Consultant	Hard copy / PM.com upload
Pre-Final PS&E/Study	TEAM, Utilities	Consultant	Hard copy / PM.com upload
Utility Relocation Plans	Brad Temme	Consultant, Utility Companies	Hard copy / PM.com upload
Final PS&E/Study	TEAM, Construction Inspector, MoDOT, Utility Companies	Consultant	Hard copy / PM.com upload

Requests for Bids	Brad Temme, Contractor	Consultant	Drexeltech.com upload / advertisement in newspaper
Construction Contract	Construction Inspector, Street Committee, City Council, MoDOT, Clerks Office	Contractor	Hard copy / PM.com upload
Notice to Proceed	Contractor	Construction Inspector	Hard copy / PM.com upload
Construction schedule and updates	Contractor, Construction Inspector, Steve Noonan, Kevin Corwin	Contractor, Construction Inspector	Hard copy / PM.com upload
Shop Drawings	Construction Inspector, TEAM	Contractor	Hard copy / PM.com upload
Material Test Results	Construction Inspector	Testing Consultant	Hard copy / PM.com upload
Inspection Logs/Reports	Construction Inspector	Contractor	Hard copy / PM.com upload
Substantial Completion Letter	Contractor	Construction Inspector	Hard copy / PM.com upload
Final Punchlist Letter	Contractor	Construction Inspector	Hard copy / PM.com upload
Construction Close-Out Documents	Construction Inspector	Contractor	Hard copy / PM.com upload

Change Management Process

Change management process steps

Planning: Changes will be posted and managed online at PM.com. Changes will be approved and closed out as they are incorporated into the design of the project by the City project manager. Changes that require exceptions to standard design practices will be documented through the use of the design exception form.

Design: Changes will be posted and managed online at PM.com. Changes will be approved and closed out as they are incorporated into the design of the project by the City project manager. Changes that require exceptions to standard design practices will be documented through the use of the design exception form. Changes resulting in supplemental agreements will be approved at staff level or taken to Council for approval in accordance with the approved procurement process.

Right-of-Way: Changes will be posted and managed online at PM.com. Changes that require Council action will be elevated to Council through staff completion of a Request for Council Action.

Utility Coordination: Changes will be posted and managed online at PM.com. Changes will be entered by the project manager or the Consultant as information becomes available from the affected utilities. As adjustments or agreements are completed to resolve conflicts corresponding changes will be closed out.

Construction: Changes will be posted and managed online at PM.com. Change order requests will be approved at staff level or taken to Council for approval in accordance with the approved procurement process.

Change control levels

The City Public Works Staff will manage the change requests and status for the project in accordance with the City standards for change approval. For changes that are within staff's approval, staff will document the resolution of the change in PM.com. For changes that require Council action, staff will prepare a RCA for Council consideration. Meeting minutes from the Council Meeting along with staff documentation in PM.com will provide a record of the change resolution. Changes to the scope, cost, and schedule will all be logged and tracked online utilizing the PM.com change tracking tool.

Communication Planning Sheet for Initiation Planning / Stakeholder Meeting

Item	Description	Responsible Party
Event	Initiation Planning / Stakeholder Meeting	Brad Temme
People (Stakeholders)	Consultant, TEAM	Brad Temme
Level of Need	Scoping Meeting to discuss expectations and Consultant questions	Brad Temme
Information	Existing City information, and Consultant information	Brad Temme
Format	Open meeting directed by City project manager	Brad Temme
Dates/Frequency	During contract negotiation / Once	Brad Temme
Notice	Outlook Meeting request	Brad Temme
Feedback	Agreement with Charter	Brad Temme
Summary	Meeting minutes	Brad Temme
Sharing	Background information	Brad Temme

Communication Planning Sheet for Right of Way Plan Public Meeting

Item	Description	Responsible Party
Event	Right of Way Plan Meeting	Brad Temme
People (Stakeholders)	Consultant, TEAM, City Council, Public	Brad Temme
Level of Need	Inform the public of the proposed right of way needs / Required if significant right of way impacts occur	Brad Temme, Consultant
Information	Consultant's Right of Way Plans, Traffic Study Information, Safety Information	Brad Temme, Consultant
Format	Public Meeting	Brad Temme
Dates/Frequency	After Right of Way Plan Approval / Once	Brad Temme
Notice	Outlook Meeting request / Public Announcements – City website and newspaper, Changeable Message Boards	Brad Temme
Feedback	Gather public opinion and concerns	Brad Temme, Consultant
Summary	Meeting minutes	Brad Temme, Consultant
Sharing	Public expectations of the project / Property needs of the project	City Staff, Consultant, Public, Public Officials

C13-113

FY 2014-2017 TRANSPORTATION IMPROVEMENT PROGRAM
CONGESTION MITIGATION AND AIR QUALITY IMPROVEMENT (CMAQ) FUNDS
NEW PROJECT APPLICATION

Clear Form and Create New Project | Retrieve Existing Project | Update/Save Project

PROJECT RECORD NUMBER 4727107 Clear All Fields

Before starting new applications, select "Clear Form and Create New Project". Applications with no record number cannot be saved. The project number will be needed if you wish to retrieve/edit/print the application at a later time.

Select one:

- ☐ In progress
- ☐ Preliminary complete (ready for comments)- Due February 15, 2013
- ☒ Final complete - Due March 8, 2013
  Signatures, Supplemental Information, and Application Fee - Due March 8, 2013

A. SPONSOR INFORMATION

Sponsoring Agency: City of St. Charles

Chief Elected Official: Mayor Sally A. Faith

Address: 200 N Second Street

City: St. Charles **State:** MO **Zip:** 63301

Email: sally.faith@stcharlescitymo.gov

Project Contact: Kevin Corwin, PE **Title:** City Engineer

Address: 200 N Second Street

City: St. Charles **State:** MO **Zip** 63301

Phone: 636-949-3513 **Fax:** 636-940-4601

E-mail: kevin.corwin@stcharlescitymo.gov

Application Contact: Tyson King, PE

E-Mail: tyson.king@stcharlescitymo.gov **Phone:** 636-949-3229

B. PROJECT INFORMATION

Project Title: Elm Point Industrial Drive and Elm Street Traffic Flow Improvements

Project Limits (i.e., Taylor Ave to Moss St or over Moss Creek - include map.):

Elm Point Industrial Drive at Elm Street

Is this project a continuation of, or is it otherwise related to, another project that previously was programmed in the TIP? If so, explain this relationship.

No

Has your agency previously competed for funds for this specific project? If so, when?

No

Does your agency own and maintain this facility? Yes **If no, a letter of support is required from the facility owner.**

Project Length (Miles): 0.10

Federal Functional Roadway Classification (per East-West Gateway): Minor Arterial <04>

(URL for functional classification maps: http://www.ewgateway.org/trans/funcclass/funcclass.htm)

Right of Way

Will additional right of way or easement be acquired?: Yes

If yes, give details below:

- **Estimated additional right of way (in acres) needed:** 0.25
- **Estimated permanent easements (in acres) needed:** 0.25
- **Estimated temporary easements (in acres) needed:** 0.25
- **Any residential or commercial displacements anticipated? If yes, give details on how many and if they are residential and/or commercial.**

No displacements are anticipated.

Right of way acquisition by: Local Agency

Right of way condemnation by: Local Agency

Utility Coordination

Will coordination with utilities be required? Yes **If yes, check the appropriate box to select the type of utility. Then give the names of the utility companies.**

Electric	✓	Ameren UE
Phone	✓	AT&T Missouri
Gas	✓	Laclede Gas
Water	✓	City of St. Charles
Cable TV	✓	Charter Communications
Storm Sewer	✓	City of St. Charles
Sanitary Sewer	✓	City of St. Charles
Other		

Please give detail concerning potential utility conflicts / problems / issues:

Overhead electric lines exist along the west side of Elm Street. Underground telcommunications and gas utilites also exsit within the project limits. The engineer will identify utility locations early on to minimize impacts and prevent project delays due to unforeseen utility relocations.

Utility coordination completed by: Consultant

Intelligent Transportation Systems (ITS) Architecture:
Projects must comply with the regional ITS standards as set forth in the document titled *Bi-State St. Louis Regional ITS Architecture*, April 2005

C. PROJECT JUSTIFICATION

Please describe 1.) the proposed improvement, 2.) the transportation problem the improvement will address, 3.) the effect the improvement will have on the problem.

Be as specific as possible. Attach additional sheets as needed.

Located on the northern edge of established residential neighborhoods within a commercial and light/heavy industrial corridor, the intersection of Elm Street with Elm Point Industrial Drive is situated in a growing section of the City of St. Charles, with ample available land for future development and growth. A recent project completed by the City increased capacity and efficiency of Elm Street between Elm Point Industrial Drive and Route 370, but did not fully address the Elm Point Industrial Drive approaches or the northbound Elm Street approach. This project will complete improvements to reduce congestion related to the increasing traffic demand on this intersection, providing capacity able to accomodate projected economic and community growth in this area.
The narrative below describes existing and projected conditions, with benefits associated with improvements to this intersection.

Eastbound Approach

The eastbound Elm Point Industrial Drive appoach to Elm Street currently consists of a single left turn lane, a single thru lane, and a short right turn lane. Existing traffic demands for the eastbound left turn result in a LOS of D in the AM Peak Hour, and a LOS of C in the PM Peak Hour. Forcasted volumes will result in a LOS of F in both the AM and PM Peak Hour.
The attached study completed in July 2010 recommended that the addtion of a second eastbound left turn lane with appoximately 175 feet of storage length. This would improve the eastbound left turn LOS to an acceptable level of D in both the AM and PM Peak Hour when forcasted demand is achieved.

Northbound Approach

The northbound Elm Street approach to Elm Point Industrial Drive currently consists of a single left turn lane, a single thru lane, and a short right turn lane. Existing traffic demands for northbound thru traffic result in an excellent LOS of C in the AM Peak Hour, and a LOS of B in the PM Peak Hour. However, forcasted volumes will result in a LOS of E in the AM Peak Hour, with an average delay per vehicle near the threshold for LOS F and 95th percentile queue length of over 600 feet.
The attached study recommended the addition of a second northbound thru lane with a length of at least 250 feet. This additional thru lane would improve the LOS to C in the AM Peak Hour and ireduce the 95th percentile queue length by approximately 65%.

Please see the attached traffic study for details on assumptions, inputs, and calculated measures of existing and future traffic flow at this critcal intersection.

Type of Project

Check the box below that best describes the primary benefit of the proposed improvement. More information can be found in Appendix A of the CMAQ workbook.

Transit

- ☐ System Startup
- ☐ Transfer Center
- ☐ Vehicle Replacement
- ☐ New Vehicle
- ☐ Park-and-Ride Facilities
- ☐ Other (specify): _____

Traffic Flow Improvements

- ☐ Traffic Signal Interconnect
- ☐ Traffic Signal Replacement
- ☐ New Traffic Signals
- ☐ Signal Controller Upgrades
- ☑ Intersection Improvements
- ☐ Roadway Bottleneck Elimination
- ☐ Other (specify): _____

Ride Share

- ☐ Rideshare Program
- ☐ Vanpool/Carpool Program
- ☐ Park-and Ride Facilities
- ☐ Reverse Commute Program
- ☐ Other (specify): _____

Pedestrian and Bicycle Program

- ☐ Bicycle Parking Improvements
- ☐ Bicycle Lanes
- ☐ Pedestrian Ways
- ☐ Other (specify): _____

Demand Management

- ☐ Transportation Management Assoc.
- ☐ Transit Pass Subsidy
- ☐ Transit Information/Marketing
- ☐ Educational Program
- ☐ Other (specify): _____

Inspection Maintenance Program

- ☐ Roadside Emission Testing
- ☐ Enhanced I-M Program
- ☐ Mechanic Training Program
- ☐ Other (specify): _____

D. EMISSIONS DATA (REQUIRED)

Attach all applicable data identified in the Data Requirements Matrix (at the end of this application) for the type of project being proposed. Provide all information as completely as possible from the area of primary benefit. Please contact East-West Gateway staff if any of the information requested is unclear or unavailable, or if there are questions concerning applicability. A summary of the emissions data is required (one to two pages). Additional project data may be submitted and is encouraged.

Note: **East-West Gateway staff will calculate the emission reduction(s).**

D. FINANCIAL PLAN

Please complete the following expenditure tables and attach a detailed cost estimate (an example is included in Appendix B of the workbooks).

Federal funds must not exceed 80% of the total cost. Fiscal years are federal fiscal years (October 1 through September 30). In Illinois, federal funds are available for FY 2014. In Missouri, federal funds are available for FY 2014 and FY 2015.

PROJECT BUDGET	FY 2014	FY 2015	FY	TOTAL
PE/Planning/ Environ. Studies	50000.00			50000.00
Right-Of-Way	40000.00			40000.00
Implementation		380000.00		380000.00
Construction Engineering		20000.00		20000.00
Implementation Total	0.00	400000.00	0.00	400000.00
PHASE TOTAL	90000.00	400000.00	0.00	490000.00

SOURCE OF FUNDS	FY 2014	FY 2015	FY	TOTAL
CMAQ Funds	72000.00	320000.00		392000.00
Other Fed. Funds* *Source:*				0.00
Other State Funds* *Source:*				0.00
Local Match Funds* *Source:* City Funds	18000.00	80000.00		98000.00
Other Funds* *Source:*				0.00
TOTAL	90000.00	400000.00	0.00	490000.00

Will any other individual, business, local public agency or other third party provide matching funds or be requested to provide matching funds in the future for this project? If yes, include a letter of support for this project from the third party that confirms their commitment to provide match or acknowledges that the sponsor may seek matching funds from the third party in the future. The letter must also document the third party's support of the proposed scope of work of the project as it is listed in the project application.

Standard TIP Project Development Schedule Form (many stages can occur concurrently)

Activity Description	Start Date (MM/YYYY)	Finish Date* (MM/YYYY)	Time Frame (Months)
Receive Notification Letter	07/2013	08/2013	1.0
Execute Agreement (Project sponsor & DOT)	08/2013	12/2013	4.0
Engineering Services Contract Submitted & Approved [1]	12/2013	01/2014	1.0
Obtain Environmental Clearances (106, CE-2, etc.)	01/2014	03/2014	2.0
Public Meeting/Hearing	05/2014	05/2014	1.0
Develop and Submit Preliminary Plans	01/2014	05/2014	4.0
Preliminary Plans Approved	05/2014	06/2014	1.0
Develop and Submit Right-of-Way Plans	06/2014	06/2014	1.0
Review and Approval of Right-of-Way Plans	07/2014	08/2014	1.0
Submit & Receive Approval for Notice to Proceed for Right-of-Way Acquisition (A-Date) [2]	08/2014	09/2014	1.0
Right-of-Way Acquisition	09/2014	04/2015	7.0
Utility Coordination	01/2014	09/2015	21.0
Develop and Submit PS&E	06/2014	07/2015	13.0
District Approval of PS&E/Advertise for Bids [3]	07/2015	09/2015	2.0
Submit and Receive Bids for Review and Approval	09/2015	12/2015	3.0
Project Implementation/Construction	12/2015	08/2016	8.0

***Finish date must match fiscal year for each for each milestone listed below:**

1. **Preliminary engineering obligated - PE/Planning/Environ. Studies**
2. **Right of way obligated - Right-Of-Way**
3. **Construction/implementation funds obligated - Implementation/Construction Engineering**

FY 2014 = 10/2013 - 09/2014
FY 2015 = 10/2014 - 09/2015
FY 2016 = 10/2015 - 09/2016
FY 2017 = 10/2016 - 09/2017

Financial Certification of Matching Funds

This is to assure sufficient funds are available to pay the non-federal share of project expenditures for the following projects to be funded under the provisions of MAP-21. Only one certification per sponsoring agency is necessary.

Project Title	**Non-federal Amount**
Elm Point Industrial Drive and Elm Street Traffic Flow Improvements	98000.00

Sponsoring Agency: City of St. Charles

Chief Elected Official (or Chief Executive Officer):

Name (Print): Mayor Sally A. Faith

Signature: Sally A Faith

Attest:

City Clerk

Date: 3/7/13

Chief Financial Officer:

Name (Print): Kelly Vaughn

Signature: Kelly Vaughn

Date: 3/5/13

E. Person of Responsible Charge Certification

The key regulatory provision, 23 CFR 635.105 – *Supervising Agency,* provides that the State Transportation Agency (STA) is responsible for construction of Federal-aid projects, whether it or a local public agency (LPA) performs the work. The regulation provides that the STA and LPA must provide its full-time employee to be in "responsible charge" of the project.

The undersigned employees(s) of the Project Sponsor will act as person of responsible charge. If at any point the employee leaves the LPA, the LPA is responsible for finding a suitable replacement and notifying East-West Gateway. If the person of responsible charge is found to not be a full-time employee of the LPA, it will result in the loss of federal funds for this project. One employee can act as person of responsible charge for all three phases.

Person of responsible charge – design phase

Name: Eric Allmon, PE

Title: Sr. Project Manager E-mail: eric.allmon@stcharlescitymo.gov

Signature: E. L All

Person of responsible charge – right of way acquisition phase

Name: Brian Faust, IFAS

Title: Right of Way Specialist E-mail: brian.faust@stcharlescitymo.gov

Signature: Brian Faust

Person of responsible charge – construction phase

Name: Stephen Noonan, PE

Title: Sr. Project Manager E-mail: stephen.noonan@stcharlescitymo.gov

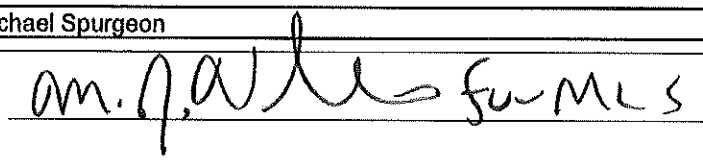
Signature: Stephen P Noonan

F. Title VI Certification

The Project Sponsor shall comply with all state and federal statutes relating to nondiscrimination, including but not limited to Title VI and Title VII of the Civil Rights Act of 1964, as amended (42 U.S.C. §2000d and §2000e, et seq.), as well as any applicable titles of the "Americans with Disabilities Act" (42 U.S.C. §12101, et seq.). In addition, if the Grantee is providing services or operating programs on behalf of the Department or the Commission, it shall comply with all applicable provisions of Title II of the "Americans with Disabilities Act".

The undersigned representative of the Project Sponsor hereby certifies that it has policies and procedures in place to comply with Title VI of the Civil Rights Act of 1964.

Name Michael Spurgeon

Signature 

G. Right-of-Way Acquisition

To be completed by Missouri project sponsors only.

The Missouri Department of Transportation (MoDOT) and the Federal Highway Administration (FHWA) have the right and responsibility to review and monitor the acquisition procedures of any federally funded transportation project for adherence to The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970." Those projects found in non-compliance may jeopardize all or part of their federal funding.

A. The Project Sponsor hereby certifies that ANY right of way, and/or permanent or temporary easements necessary for this project, obtained prior to this application, were acquired in accordance with The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970.

B. The Project Sponsor also certifies that any additional right of way, and/or permanent or temporary easements, subsequently required to complete the project, will be acquired according to The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970.

Sally A. Faith 3/19/13

Certification Signature

SALLY A. FAITH - MAYOR

Attest:

City Clerk

H. Reasonable Progress

To be completed by Missouri project sponsors only.

Attached is a copy of the resonable progress policy adopted by the East-West Gateway COG Board of Directors.

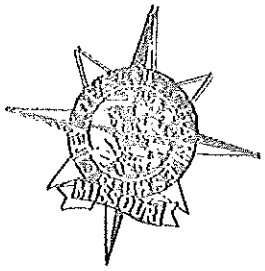
The undersigned representative of the Project Sponsor hereby certifies that he/she has read this policy and understands its requirements. The representative acknowledges that failure to meet all of the reasonable progress requirements could result in federal funds being revoked and returned to the regional funding pool, as dictated by the policy.

Certification Signature: Sally A. Faith 3/7/13

SALLY A. FAITH - MAYOR

Attest:

City Clerk



EAST-WEST GATEWAY
Council of Governments
Creating Solutions Across Jurisdictional Boundaries

Policy on Reasonable Progress

Reasonable Progress

For projects or programs included in the Transportation Improvement Program, "reasonable progress" will have been made if the project has advanced to the point of obligating all federal funds programmed for that project in the current fiscal year, regardless of the phase of work (i.e., Preliminary Engineering (PE), Right of Way Acquisition (ROW), or Plans Specifications and Estimates (PSE)/Construction). If a project fails to obligate the programmed federal funds by September 30 of the current year, the funding will be forfeited and returned to the regional funding pot. Actual progress toward implementation is measured against the schedule submitted by the project sponsor in the project application.

Policy Procedures and Enforcement

Projects that do not obligate all federal funds by the September 30 suspense date will be removed from the TIP, and the federal funds associated with those projects will be returned to the regional funding pool for redistribution. The removal of projects from the TIP will require no further Board action and the sponsor would have to repay any federal funds already spent if the funding is forfeited.

If a project is realizing delays that will put the federal funding at risk of forfeiture (i.e., not meet a September 30 deadline), the project sponsor will have the opportunity to ask for consideration of a "one-time extension" in their project schedule. The one-time extension can only be requested for the implementation/construction phase of the project. The extension request will only be considered once a year, and has to be made before June 1 of the current fiscal year of the TIP.

To be considered for this extension the sponsor has to demonstrate on all counts: a.) The delay is beyond their control and the sponsor has done diligence in progressing the project; b.) Federal funds have already been obligated on the project or in cases that no federal funds are used for PE and/or ROW acquisition, there has been significant progress toward final plan preparation; c.) There is a realistic strategy is in place to obligate all funds.

One-time extensions of up to three (3) months may be granted by East-West Gateway staff and one-time extensions greater than three (3) months, but not more than nine (9) months, will go to the Board of Directors for their consideration and approval. Projects requesting schedule advancements will be handled on a case-by-case basis(subject to available funding) and are subject to the Board adopted rules for TIP modifications.

EAST-WEST GATEWAY
Council of Governments
Creating Solutions Across Jurisdictional Boundaries

Policy on Reasonable Progress

Project Monitoring

An extensive monitoring program has been developed to help track programmed projects and ensure that funding commitments and plans are met. Monthly reports are developed and posted on the East-West Gateway website, utilizing project information provided by the IDOT and MoDOT District offices. Additionally, project sponsors are contacted, at least every three months, by EWGCOG staff for project status interviews.

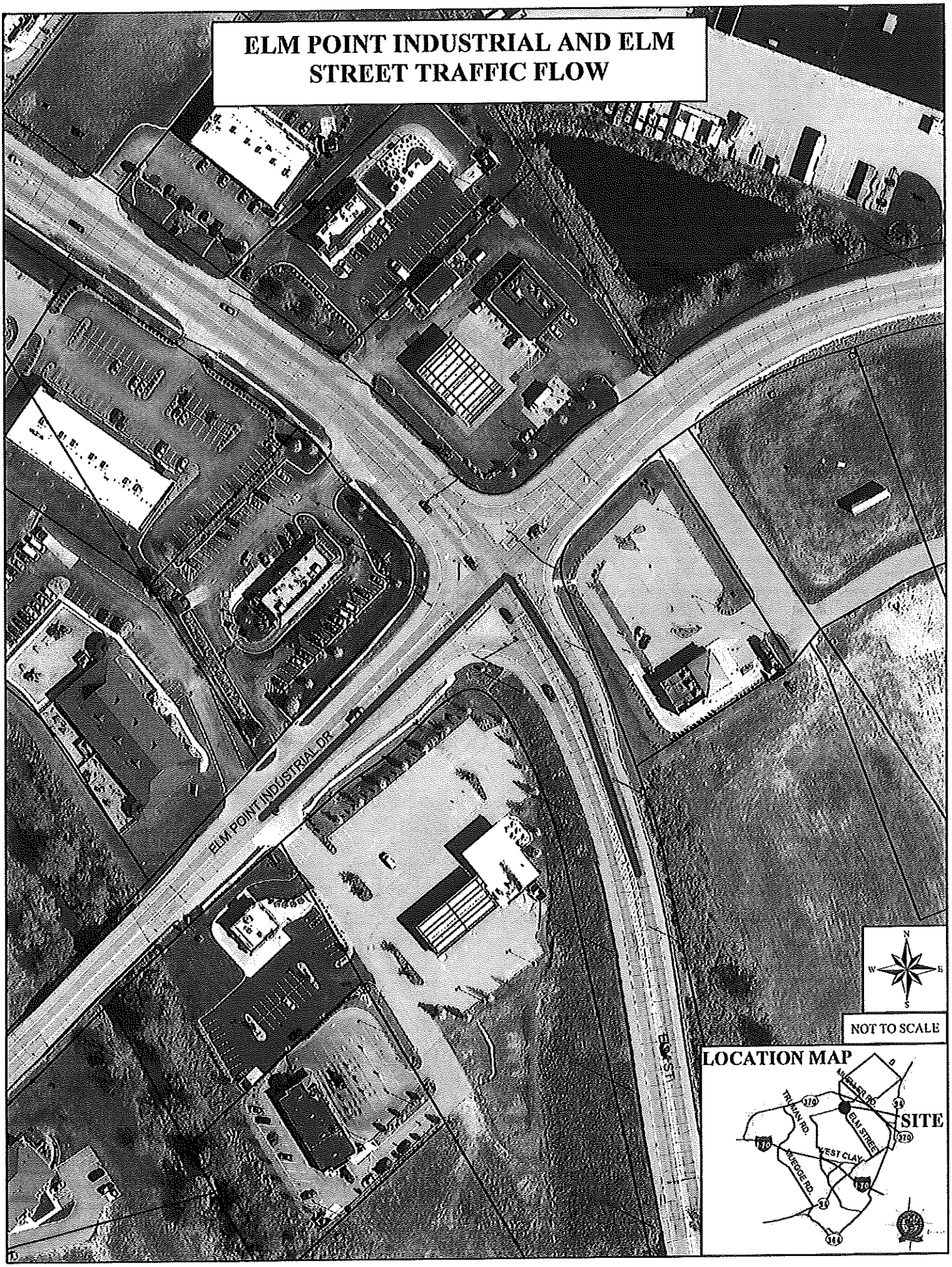
Data Requirements Matrix

	Contact Gateway Staff for Details	Annual Miles per Vehicle	Auto Access Trip Length	Auto Trips Diverted per Day	Auto Trips Eliminated per Day	Average Age of Fleet	Average Number of Miles Driven	Capacity (after)	Capacity (present)	Deadhead Factor	Eligible Riders	g/bhp-hr (after)	g/bhp-hr (present)	Hours of operation (daily)	Number of Vehicles	Occupancy Rate (after)	Occupancy Rate (present)	Route Length
Transit Improvements																		
System Start Up				X	X			X	X	X		X	X	X	X	X	X	X
Transfer Center			X	X	X			X	X							X	X	
Vehicle Replacement		X				X		X	X	X		X	X	X	X	X	X	X
New Vehicle								X	X	X		X	X	X	X	X	X	X
Park-Ride Facilities			X	X	X			X	X							X	X	
Feeder System			X	X	X	X		X	X	X				X	X	X	X	X
Other	X																	
Shared Ride Services																		
Rideshare Programs				X	X		X				X					X	X	
Vanpool/carpool Programs				X	X		X				X					X	X	
Reverse Commute Program				X	X		X				X					X	X	
Park-Ride Facilities			X	X	X			X	X							X	X	
Other	X																	
Demand Management Strategies																		
Transportation Mgt Assoc	X																	
Transit Pass Subsidy	X																	
Transit Information/Marketing	X																	
Educational Programs	X																	
Other	X																	

Data Requirements Matrix
(continued)

	Contact Gateway Staff for Details	Auto Trips Diverted per Day	Auto Trips Eliminated per Day	Average Delay per vehicle (after)	Average Delay per vehicle (present)	Avg Daily Traffic (after)	Avg Daily Traffic (present)	Capacity (after)	Capacity (present)	Households Affected	Posted Speed Limit	Project Length	Speed (after)	Speed (present)	Trips per Household	Usage (after)	Usage (present)
Traffic Flow Improvements																	
Traffic Signal Interconnect				X	X	X	X				X	X	X	X			
Traffic Signal Replacement				X	X	X	X				X	X	X	X			
New Traffic Signals				X	X	X	X				X	X	X	X			
Signal Controller Upgrades				X	X	X	X				X	X	X	X			
Intersection Improvements				X	X	X	X				X	X	X	X			
Roadway Bottleneck Elimination				X	X	X	X				X	X	X	X			
ITS	X																
Other	X																
Pedestrian & Bicycle Improvement																	
Bicycle Parking Improvements		X	X									X				X	X
Bicycle Lanes		X	X									X				X	X
Pedestrian Ways		X	X							X		X				X	X
Education Program		X	X							X					X		
Other	X																
Inspection Maintenance																	
Roadside Emission Testing	X																
Enhanced I-M Program	X																
Mechanic Training Program	X																
Other	X																

ELM POINT INDUSTRIAL AND ELM STREET TRAFFIC FLOW



Elm Point Industrial at Elm Street Traffic Flow Improvements
2/25/2013

Item	Description	Quantity	Unit	Unit Cost	Cost
1	PCC Pavement	1100	SY	$100.00	$110,000
2	Curbs	250	LF	$30.00	$7,500
3	Commercial Entrances	3	Each	$12,000.00	$36,000
4	Island Modifications (NWQ)	1	LS	$10,000.00	$10,000
5	New Conc. Islands (NEQ and SWQ)	100	SY	$100.00	$10,000
6	Sidewalk	350	SY	$65.00	$22,750
7	Curb Ramps	6	Each	$500.00	$3,000
8	Crosswalks	1	LS	$7,000.00	$7,000
9	Pavement Markings	1	LS	$5,000.00	$5,000
10	Remove and Relocate Signs	1	Each	$5,000.00	$5,000
11	Removal of Improvements	1	Each	$24,500.00	$24,500
12	Traffic Signal Modifications	1	LS	$60,000.00	$60,000
13	Traffic Control	1	LS	$20,257.15	$20,257

Construction Subtotal				$321,007
Construction Contingency (10%)				$32,101
Inflation (3% for 3 years)				$32,743
Construction Subtotal				$385,850
Construction Rounded				$380,000
Const. Mngmt. (5% Const. Subtotal)				$19,293
Construction Engineering Rounded				$20,000
Construction Total				$405,143
Engineering Tot. (15% Const. Subt.)				$57,877.57
Design Rounded				$50,000.00
TOTAL PROJECT COST				**$490,000**
REQUIRED LOCAL MATCH (20%)				**$98,000**
Right of Way (Not Part of Construction Subtotal)				
7.5' Strip of R/W adjacent to widening	3750	SF	$9.00	$33,750
Right of Way Rounded				$40,000.00

Table 2 : Capacity Analysis Comparison (Level of Service, Delay, V/C & 95th Percentile Queue)
2010 & 2030 Forecasted Traffic Volumes – AM PEAK HOUR
Intersection of Elm Street at Elm Point Industrial
St. Charles, Missouri

	2010 Proposed Design Conditions			*2030 Proposed Design Conditions*			*2030 Proposed Design & Dual EB LT Conditions*			*2030 Proposed Design & Dual EB LT & 2 NB Thru Lane Condition*			*2030 Proposed Design & Dual EB LT & 2 NB Thru & Dual SB LT Condition*			*Two Lane Roundabout Alternative*		
Movement	*LOS (Delay)*	*V/C Ratio*	*95th %tile Queue Length*	*LOS (Delay)*	*V/C Ratio*	*95th %tile Queue Length*	*LOS (Delay)*	*V/C Ratio*	*95th %tile Queue Length*	*LOS (Delay)*	*V/C Ratio*	*95th %tile Queue Length*	*LOS (Delay)*	*V/C Ratio*	*95th %tile Queue Length*	*LOS (Delay)*	*V/C Ratio*	*95th %tile Queue Length*
Elm Street at Elm Point Industrial (Signalized)																		
Eastbound Left-Turn	D (41.5)	0.81	#170	F (98.5)	1.06	#283	D (53.1)	0.79	#156	D (48.4)	0.74	#139	D (48.4)	0.74	#139	B (18.0)	0.51	105
Eastbound Thru	C (25.3)	0.30	89	D (45.0)	0.69	202	D (48.4)	0.73	205	D (39.1)	0.62	192	D (44.2)	0.69	192	A (9.8)	0.51	105
Eastbound Right-Turn	A (8.9)	0.13	26	A (8.3)	0.29	42	A (8.7)	0.30	42	A (7.5)	0.26	40	A (7.9)	0.28	40	B (11.2)	0.51	105
Eastbound (Approach)	C (33.5)			E (64.9)			D (44.2)			D (38.5)			D (40.4)			B (14.0)	0.51	105
Westbound Left-Turn	B (16.4)	0.07	20	D (36.4)	0.63	118	C (32.0)	0.58	115	C (31.2)	0.57	111	C (27.5)	0.53	105	C (23.1)	0.58	124
Westbound Thru	C (32.2)	0.43	84	D (49.0)	0.69	174	D (49.0)	0.69	174	D (47.1)	0.67	172	D (44.5)	0.64	164	B (14.9)	0.58	130
Westbound Right-Turn	A (9.5)	0.28	33	A (9.3)	0.46	55	A (6.9)	0.46	55	A (9.0)	0.46	55	A (8.5)	0.45	52	B (15.8)	0.58	130
Westbound (Approach)	C (21.9)			C (31.7)			D (30.4)			C (29.4)			C (27.1)			C (17.7)	0.58	130
Northbound Left-Turn	A (8.3)	0.19	50	B (11.1)	0.31	70	B (11.6)	0.31	72	B (12.2)	0.30	76	B (12.5)	0.30	83	D (42.5)	0.96	475
Northbound Thru	C (27.6)	0.72	#406	E (61.4)	0.99	#608	E (70.2)	1.02	#620	C (24.8)	0.52	220	C (24.4)	0.51	220	C (34.3)	0.96	495
Northbound Right-Turn	A (4.4)	0.17	32	A (6.4)	0.45	82	A (6.9)	0.47	87	A (4.4)	0.43	58	A (4.4)	0.43	58	C (34.9)	0.96	495
Northbound (Approach)	C (21.1)			D (38.3)			D (43.6)			D (17.1)			B (16.9)			D (35.6)	0.96	495
Southbound Left-Turn	B (15.0)	0.56	100	D (53.8)	0.92	#369	D (52.6)	0.92	#369	C (26.1)	0.80	#255	D (46.2)	0.74	#189	B (15.9)	0.51	99
Southbound Thru	B (16.0)	0.29	145	B (17.1)	0.37	184	B (17.8)	0.38	188	B (19.0)	0.39	197	C (204)	0.40	209	A (8.1)	0.51	99
Southbound Right-Turn	A (4.5)	0.12	29	A (3.2)	0.16	30	A (3.4)	0.16	31	A (3.6)	0.17	32	A (4.0)	0.17	34	A (9.5)	0.51	99
Southbound (Approach)	B (13.6)			C (31.9)			C (31.6)			B (19.9)			C (29.8)			B (11.9)	0.51	99
Overall	C (21.8)			D (41.1)			D (38.4)			C (24.3)			C (26.8)			C (21.9)		

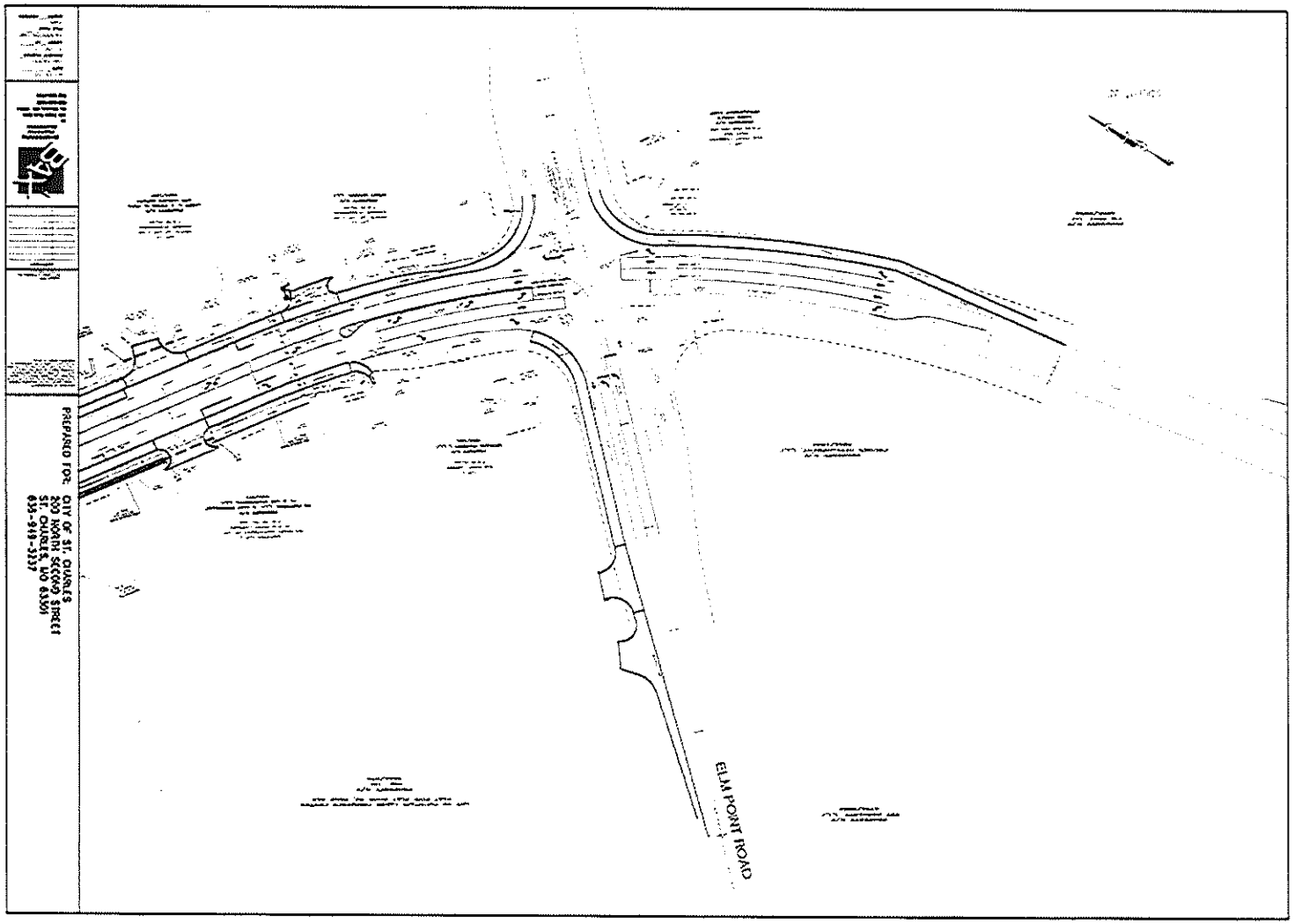
*Delay shown in Seconds per Vehicle
**Queue Length shown in Feet

Table 3 : Capacity Analysis Comparison (Level of Service, Delay, V/C & 95th Percentile Queue)
2010 & 2030 Forecasted Traffic Volumes – PM PEAK HOUR
Intersection of Elm Street at Elm Point Industrial
St. Charles, Missouri

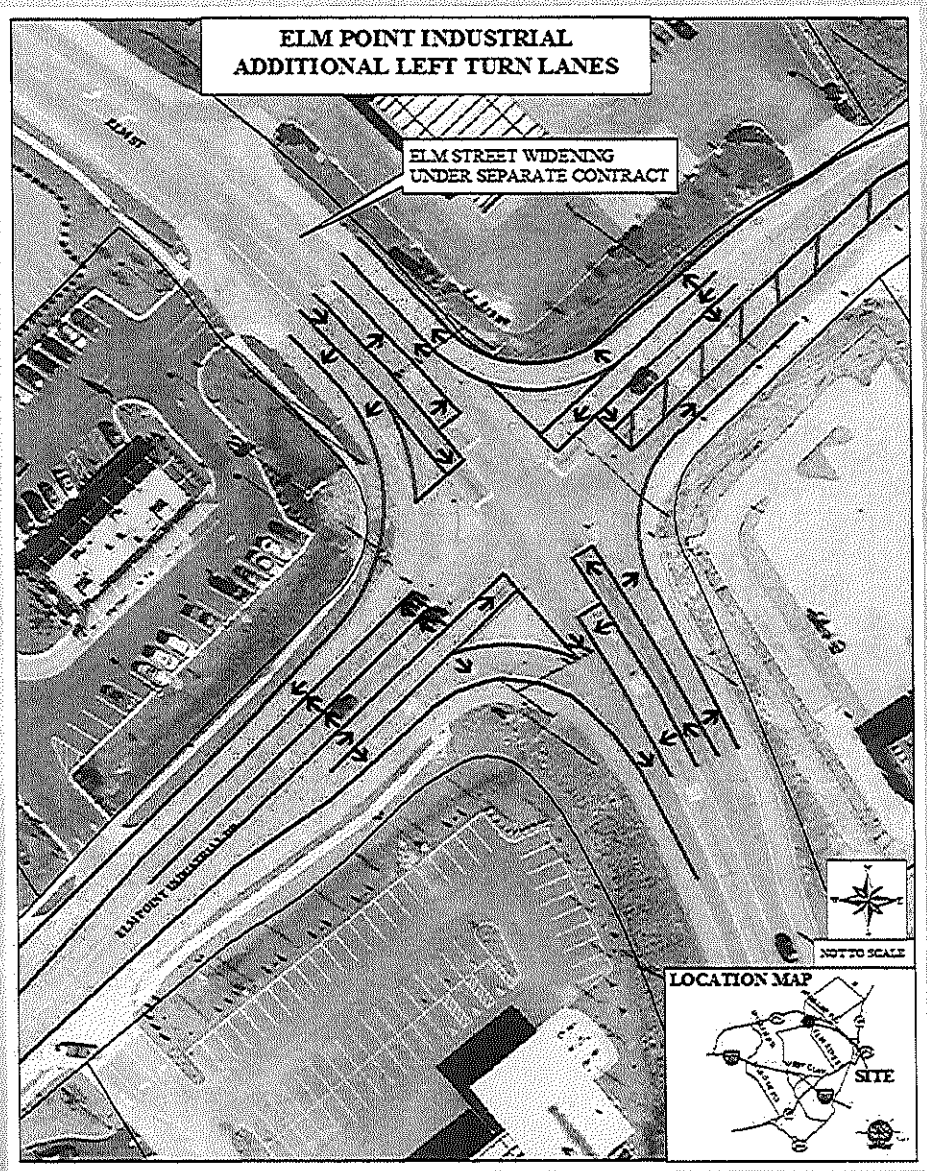
	2010 Proposed Design Conditions			*2030 Proposed Design Conditions*			*2030 Proposed Design & Dual EB LT Conditions*			*2030 Proposed Design & Dual EB LT & 2 NB Thru Lane Condition*			*2030 Proposed Design & Dual EB LT & 2 NB Thru & Dual SB LT Condition*			*Two Lane Roundabout Alternative*		
Movement	*LOS (Delay)*	*V/C Ratio*	*95th %tile Queue Length*	*LOS (Delay)*	*V/C Ratio*	*95th %tile Queue Length*	*LOS (Delay)*	*V/C Ratio*	*95th %tile Queue Length*	*LOS (Delay)*	*V/C Ratio*	*95th %tile Queue Length*	*LOS (Delay)*	*V/C Ratio*	*95th %tile Queue Length*	*LOS (Delay)*	*V/C Ratio*	*95th %tile Queue Length*
Elm Street at Elm Point Industrial (Signalized)																		
Eastbound Left-Turn	C (31.7)	0.25	126	F (80.7)	0.98	#223	D (46.8)	0.67	118	D (44.6)	0.64	116	D (43.0)	0.61	114	D (35.7)	0.87	245
Eastbound Thru	C (30.1)	0.19	96	D (50.6)	0.75	#214	D (48.8)	0.73	#214	D (47.6)	0.72	#214	D (52.5)	0.78	#232	C (26.4)	0.87	260
Eastbound Right-Turn	A (8.4)	0.19	36	A (8.6)	0.47	57	A (8.5)	0.46	57	A (8.4)	0.46	57	A (8.8)	0.48	58	C (27.3)	0.87	260
Eastbound (Approach)	C (26.1)			D (49.9)			D (36.4)			D (35.1)			D (36.3)			D (30.2)	0.87	260
Westbound Left-Turn	B (19.4)	0.23	32	D (54.8)	0.82	#150	C (34.3)	0.66	137	C (29.2)	0.60	132	D (36.7)	0.69	#152	C (21.9)	0.75	165
Westbound Thru	C (34.3)	0.14	88	D (46.3)	0.66	174	D (44.7)	0.63	174	D (41.6)	0.59	172	D (52.8)	0.74	#207	B (14.2)	0.75	215
Westbound Right-Turn	A (9.7)	0.14	53	C (33.7)	0.90	#261	D (43.9)	0.94	#300	D (43.8)	0.94	#309	D (42.1)	0.76	280	B (16.6)	0.75	215
Westbound (Approach)	B (18.4)			D (41.3)			D (41.9)			D (40.0)			D (43.3)			C (17.3)	0.75	215
Northbound Left-Turn	A (8.5)	0.54	32	B (15.6)	0.46	50	B (19.9)	0.50	61	C (20.4)	0.50	62	C (20.2)	0.49	61	C (6.6)	0.67	170
Northbound Thru	B (18.9)	0.44	244	C (23.0)	0.61	333	C (26.7)	0.66	355	C (20.5)	0.36	153	B (19.7)	0.35	150	B (8.8)	0.67	175
Northbound Right-Turn	A (4.3)	0.44	26	A (3.1)	0.29	42	A (3.5)	0.31	44	A (3.8)	0.32	46	A (3.7)	0.31	45	B (8.8)	0.67	175
Northbound (Approach)	B (15.3)			B (16.4)			B (19.2)			B (15.7)			B (15.2)			C (14.3)	0.67	175
Southbound Left-Turn	A (9.0)	0.58	65	B (17.3)	0.69	126	C (23.9)	0.76	#165	B (17.4)	0.63	147	D (45.0)	0.67	131	C (23.4)	0.83	350
Southbound Thru	C (22.4)	0.49	#447	C (30.2)	0.84	#664	D (38.5)	0.90	#702	D (45.1)	0.94	#726	D (36.3)	0.88	# 689	B (15.6)	0.83	350
Southbound Right-Turn	A (3.2)	0.49	36	A (2.6)	0.23	36	A (3.2)	0.25	40	A (3.9)	0.26	45	A (3.0)	0.24	38	B (16.9)	0.83	350
Southbound (Approach)	B (16.4)			C (22.8)			C (29.4)			C (32.0)			C (32.9)			C (17.6)	0.83	350
Overall	B (18.2)			C (30.6)			C (31.3)			C (30.7)			C (31.9)			B (19.2)		

*Delay shown in Seconds per Vehicle
**Queue Length shown in Feet

Figure 5: Conceptual Layout of Dual Eastbound Left-Turns & Dual NB Thru Lanes



ELM POINT INDUSTRIAL DRIVE ADDITIONAL LEFT TURN LANES



ELM POINT INDUSTRIAL DRIVE ADDITIONAL LEFT TURN LANES

- GOAL OF PROJECT: Improve traffic flow
- PROJECT DESCRIPTION: Additional turn lanes will be required at the intersection if Elm Point Industrial Road connects to Truman Blvd. and upon Walsh Ct. extension to New Town.
- PROJECT LIMITS: Intersection of Elm Point Industrial Dr and Elm St.
- ESTIMATED COST: $235,000
- OUTSIDE FUNDING: Requesting Federal CMAQ
- SCHEDULE:

Design:	2013
ROW:	2013
Construction:	2014

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MISSOURI HOUSE OF REPRESENTATIVES

Anne Zerr
State Representative
District 65

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Economic Development – Chair

Member:
Appropriations – Health, Mental Health and Social Services
Appropriations – Revenue, Transportation and Economic Development
Administration & Accounts
Tourism & Natural Resources
Joint Committee on
Life Sciences

February 27, 2013

Kevin Corwin
City Engineer
City of St. Charles
200 N. Second Street
St. Charles, MO 63301

Dear Kevin:

I am writing in support for the City of St. Charles' Elm Point Industrial at Elm Street Traffic Improvements Project. This project will provide numerous benefits for our community and region as it addresses much needed infrastructure improvements for the city and will create an environment that will foster community development and job creation.

The Elm Point Industrial at Elm Street Traffic Improvements Project will reduce congestion and improve access within the community along a vital corridor, reduce pollution, and create safer transportation options for everyone traveling through St. Charles.

I appreciate your consideration,

Anne Zerr

DISTRICT OFFICE
PO Box 62
St. Peters, MO 63376
Telephone (636) 294-2526

CAPITOL OFFICE
State Capitol, Room 326
Jefferson City, MO 65101-6806
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MISSOURI SENATE
President Pro Tem
Tom Dempsey
District 23

January 31, 2013

Kevin Corwin
City Engineer
City of St. Charles
200 N. Second Street
St. Charles, MO 63301

Dear Kevin:

Please accept this letter of support for the City of St. Charles' Elm Point Industrial at Elm Street Traffic Improvements Project. This is clearly a project that will provide numerous benefits for our community and region.

This project not only addresses much needed infrastructure improvements for the city, it will create an environment that will foster community development and job creation.

The Elm Point Industrial at Elm Street Traffic Improvements Project will reduce congestion and improve access within the community along a vital corridor, reduce pollution, and create safer transportation options for everyone traveling through St. Charles.

I look forward to continuing to work with you and other key partners to ensure an improved transportation system is in place to provide long-term benefits for our region.

Sincerely,

Tom Dempsey

TD/kd

CBB Crawford, Bunte, Brammeier
Traffic and Transportation Engineers

Since 1973

Date: June 28, 2010 (Revised July 19, 2010)

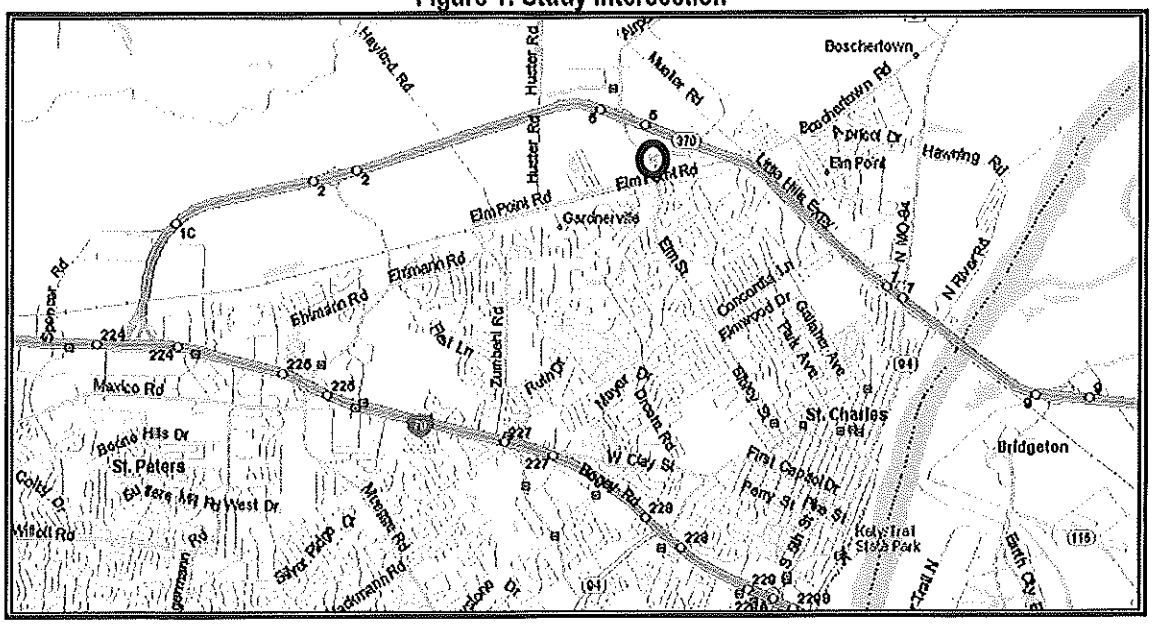
To: Mr. Rick Lewis, Senior Traffic Project Manager
City of St. Charles
200 North Second Street
St. Charles, Missouri

From: Srinivas Yanamanamanda, PE, PTOE, PTP
Shawn Leight, PE, PTOE, PTP
Brian Rensing, PE, PTOE

Project: Elm Street / Elm Point Industrial Drive Intersection Alternatives Analysis

Crawford Bunte Brammeier (CBB) is pleased to submit this technical memorandum summarizing traffic forecasts and operating conditions for Elm Street / Elm Point Industrial Drive intersection in St. Charles, Missouri. This memorandum summarizes the methodology and assumptions used for generating 2030 traffic forecasts and operating conditions for the study intersection. **Figure 1** shows the study intersection.

Figure 1: Study Intersection



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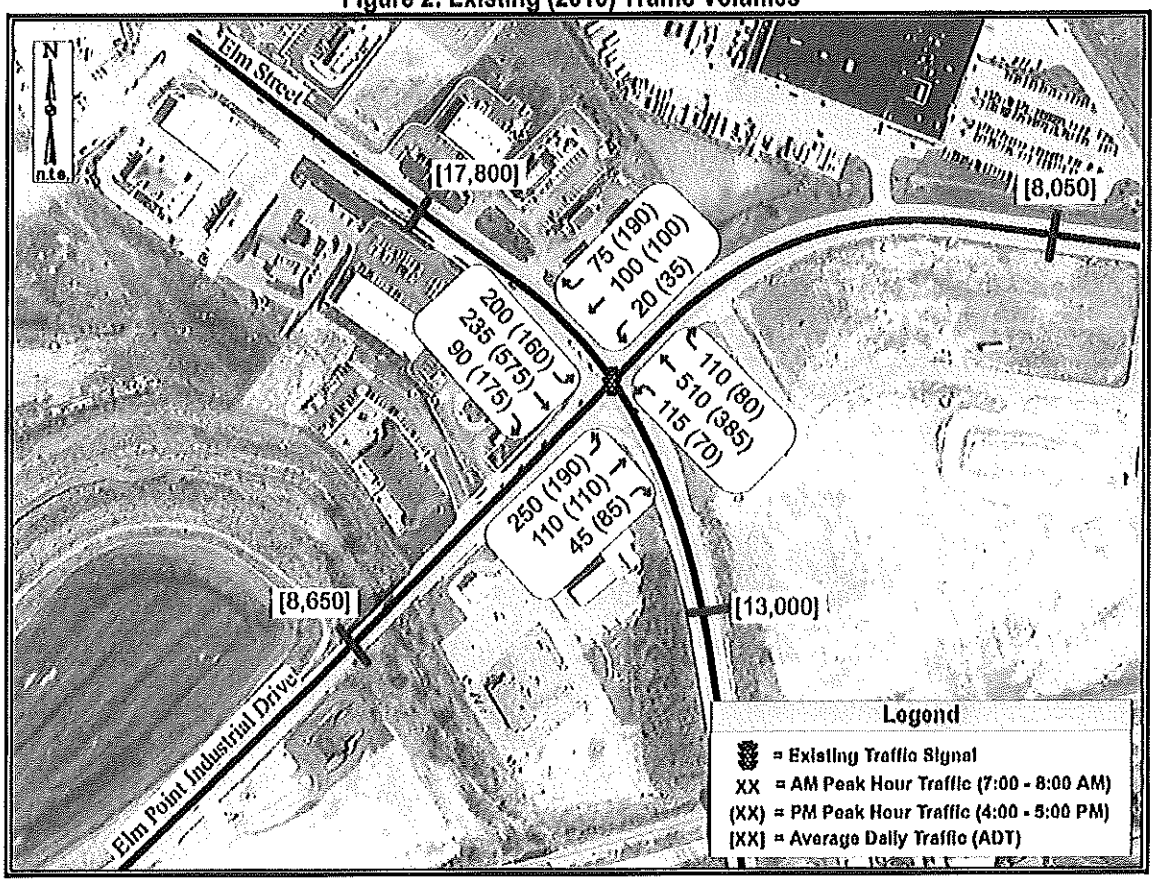
Traffic Forecasting Methodology

2030 traffic forecasts were generated based on 2010 (existing) traffic volumes and application of St. Charles County Travel Demand Model. 2010 traffic volumes were provided by the City of St. Charles and are shown in **Figure 2.**

Figure 2: Existing (2010) Traffic Volumes



Travel Demand Model Application & Assumptions

CBB and Bax Engineering met with staff from the City of St. Charles and St. Charles County on March 29th, 2010 to gain consensus on assumptions for generating traffic forecasts. Based on that meeting, it was agreed upon that the following assumptions be used in the development of 2030 traffic forecasts for Elm Street / Elm Point Industrial Drive intersection:

- Proposed Zumbehl Road extension and interchange with MO 370 is not included in this analysis.
- Proposed extension of Elm Point Road to Truman Road to connect with the newly constructed frontage road is included in this analysis.
- Extension of Walsh Court to New Town development is included in the analysis.
- 2030 traffic forecasts include complete build-out of New Town development, Premier 370 development, large scale commercial development along Route 94 near I-70/Lindenwood University, and relocation of the St. Charles Post Office in the vicinity of this proposed commercial development site.

Based on the meeting with St. Charles County, the 2023 base model scenario of the County's travel demand model was used as a starting point for demand model application for this study. The following is a summary of updates/changes to the network and land use from base scenario used to develop a 2023 Elm Point scenario for developing traffic forecasts:

- Elm Point Road was extended to Truman Road to connect with an east/west road through Premier 370 south of MO 370.
- Salt River Road connection between MO 370 and Route 79 was included in the roadway network.
- 400 apartment units were added to Transportation Analysis Zone (TAZ) 265 to reflect build-out of New Town development. This was based on "Traffic Impact Study for New Town Development" completed by CBB in July 2003. St. Charles County's 2023 model included 3100 homes in New Town but not 400 apartments.
- 1000 employees were added to TAZ 245 and TAZ 270 to reflect build-out of Premier 370 development. This was based on January 2008 Technical Memorandum by CBB for Premier 370 Impact Study. St. Charles County's 2023 model included only a partial build-out of Premier 370.
- 500,000 sq. ft of industrial development was added to TAZ 269 to reflect potential development south of MO 370 and east of Truman Road. St. Charles County's 2023 model did not assume any development in this TAZ.
- 150,000 sq. ft of retail development was added to TAZ 286 to reflect potential large-scale commercial development along Route 94 near I-70/Lindenwood University

Appendix A shows intersection data outputs from the modified 2023 Elm Point Scenario and 2008 and 2050 model scenarios. Note that St Charles County's "2050 model scenario" represents a "full build out" of St. Charles County.

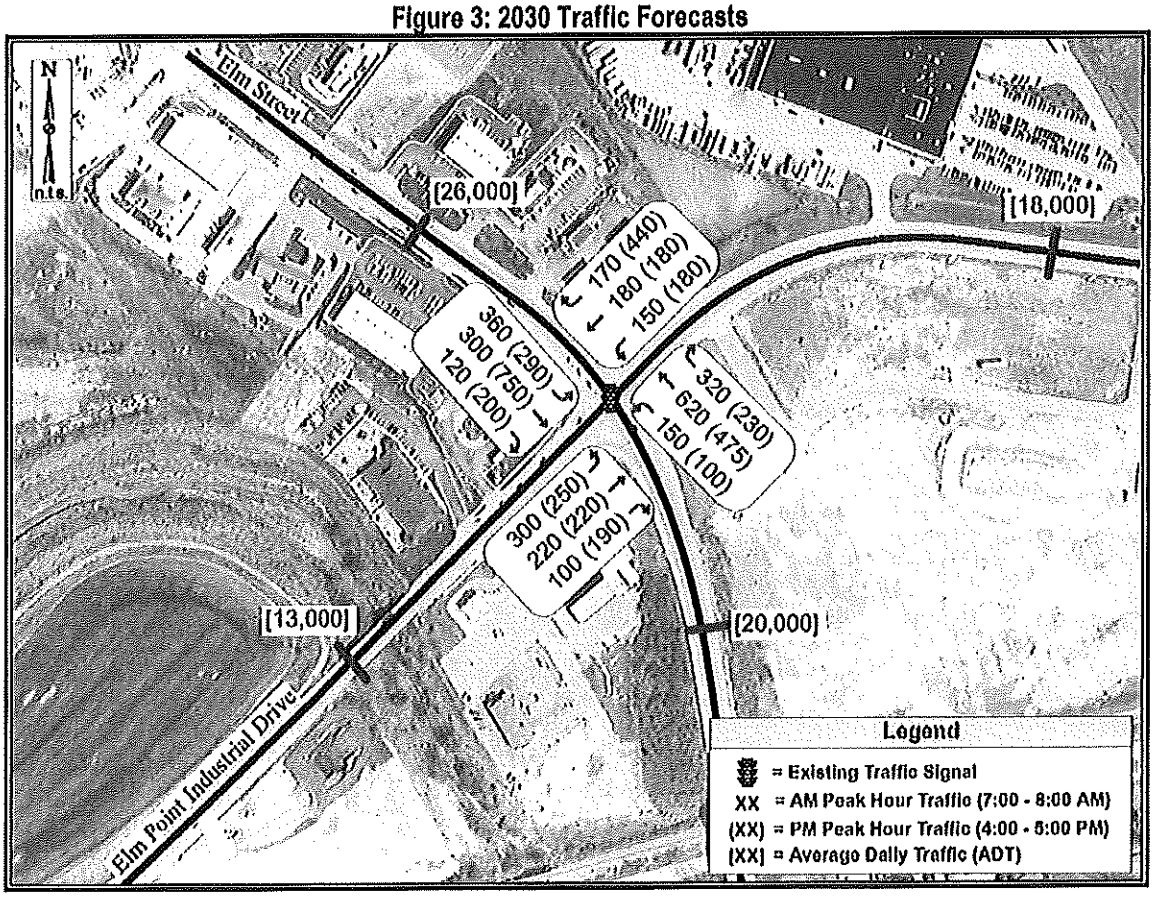
2030 Traffic Forecasts

As described earlier, 2030 traffic forecasts for Elm Street / Elm Point Industrial Drive intersection were developed by applying growth rates predicted by the modified 2023 Elm Point scenario to 2010 traffic volumes. The growth rates predicted by 2023 Elm Point scenario were based on increases from 2008 model scenario and included adjustments to account for model limitations like under-prediction of travel demand. Additionally, based on 2050 model scenario, a 1.5% annual background growth rate was used for through traffic along Elm Street to generate 2030 traffic forecasts. **Figure 3** shows 2030 traffic forecasts for the study intersection.

As can be seen from **Figure 3**, 2030 traffic forecasts for Elm Street / Elm Point Industrial Drive intersection reflect approximately 50% total growth along the north, south and west legs of the intersection and 125% total growth on the east leg of the intersection. The aggressive growth on the east leg can be attributed to the new connection to New Town via the study intersection resulting from Walsh Court extension.

CBB also coordinated with CMT to ensure consistency between this study's traffic forecasts and Elm Point Road Corridor Location Study being completed by CMT. Preliminary traffic forecasts from CMT's study show that forecasts along Elm Point Industrial Drive are consistent between the two studies.

Figure 3: 2030 Traffic Forecasts



Intersection Capacity Analysis Methodology

The operating conditions were evaluated using Synchro, which uses the study procedures outlined in the "Highway Capacity Manual," published in 2000 by the Transportation Research Board. This manual, which is used universally by highway and traffic engineers to measure roadway capacity, established six levels of traffic service: Level A ("Free Flow") to Level F ("Fully Saturated"). Levels of service are measures of traffic flow, that consider such factors as speed and delay time, traffic interruptions, safety, driving comfort, and convenience. Level C, which is normally used for highway design, represents a roadway with volumes ranging from 70% to 80% of its capacity. However, Level D is considered acceptable for peak period conditions in urban and suburban areas.

It must be acknowledged that the perception of acceptable traffic service varies widely by area. Specifically, more delay is usually tolerated in urban and suburban regions. Based on the character of this area, we believe that LOS D would be an appropriate target for peak period traffic operations.

The thresholds that define LOS are based upon the type of traffic control used at an intersection; i.e., whether it is signalized or unsignalized. For signalized and all-way stop intersections, the average control delay per vehicle is estimated for each movement and aggregated for each approach and the intersection as a whole. At intersections with partial (side-street) stop control, the delay for each minor movement is determined instead of for the intersection as a whole since motorists on the main road are not required to stop.

LOS is directly related to control delay. At signalized intersections, the LOS criteria differ from that at unsignalized intersections primarily because different transportation facilities create different driver expectations. The expectation is that a signalized intersection is designed to carry higher traffic volumes and, consequently, may experience greater delay than an unsignalized intersection. Furthermore, motorists are guaranteed service at regular intervals as the signal cycles. **Table 1** summarizes the LOS thresholds used in the analysis.

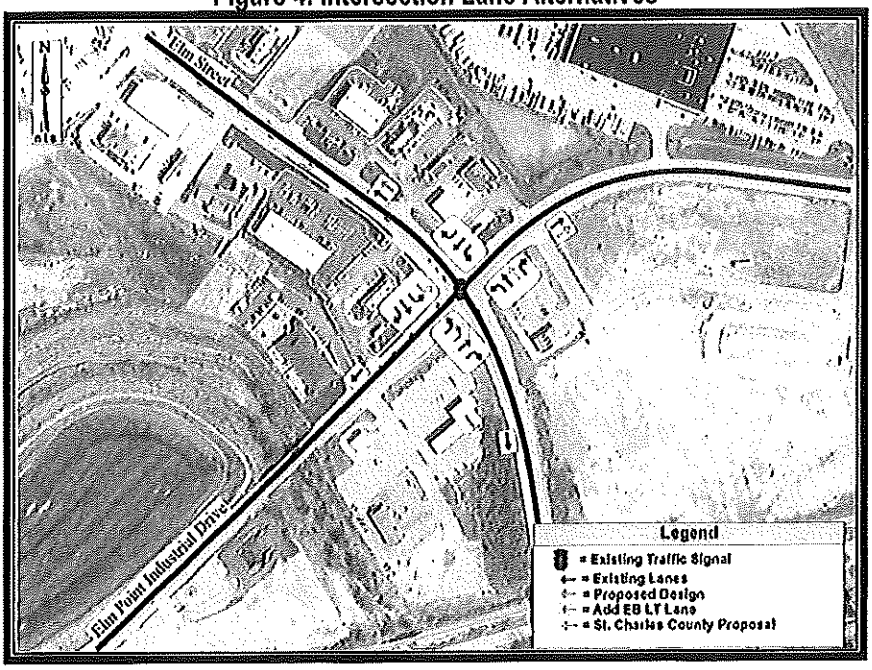
Table 1 – Level of Service Thresholds

Level of Service (LOS)	Control Delay per Vehicle (sec/veh)
	Signalized Intersections
A	≤ 10
B	> 10-20
C	> 20-35
D	> 35-55
E	> 55-80
F	> 80

Alternatives Analysis

Volume increases forecasted by 2030 drive the need to provide additional capacity with roadway improvements. Our analyses took a step-wise approach to adding road improvements to show the relative impact of each. **Figure 4** illustrates the lane alternatives evaluated in the 2030 conditions. It should be noted that when dual left-turns were assumed (eastbound and southbound left-turn), a protected only signal phasing was applied to that movement instead of the existing protected plus permitted movement.

Figure 4: Intersection Lane Alternatives



Tables 2 and **3** compare the LOS, delay, volume to capacity (V/C) ratio and the 95th percentile queue lengths for the study intersection using the 2010 and 2030 traffic volumes. The 95th percentile queue lengths are provided to assist in determining adequate storage bays for the auxillary lanes. The Synchro analysis output sheets are attached in **Appendix B.**

Committed Improvements

The proposed improvements to Elm Street (adding a second northbound through lane on Elm Street north of Elm Point Industrial), will result in the intersection operating at acceptable overall levels of service (LOS D or better) during the 2030 forecasted conditions. However, several movements are expected to fail (LOS E or worse), have excessive queue lengths, and lack adequate V/C ratios for safe and efficient operations. Specifically, the eastbound left-turn would operate at or over capacity (near/over 1.0) for both the a.m. and p.m. peak hour, the northbound thru lane is very near to capacity (0.99) during the a.m. peak, and the southbound left-turn lane is approaching capacity (over 0.9) during the a.m. peak.

Dual Eastbound to Northbound Left Turn Lanes

The first priority should be to construct dual eastbound to northbound left-turn lanes (with approximately 175 feet of storage). This improvement would result in acceptable conditions for eastbound traffic. It is notable that a new interchange at Zumbehl Road/ Route 370 would negate the need for this improvement.

Dual Northbound Through Lanes

The extension of Walsh Court into New Town will result in a significant increase in traffic on the eastern leg of Elm Point Industrial Drive. The impact of the increased traffic could be mitigated by either dual northbound through lanes (with approximately 250 feet of storage) or dual southbound left-turns (with approximately 200 feet of storage). From an operational perspective, the dual southbound left-turn lanes do not provide as much benefit (in part due to the change to protected only phasing) when compared to the dual northbound through lanes. Because of this we recommend the construction of dual northbound through lanes for traffic coming over the railroad tracks towards Route 370.

Dual northbound through lanes will require widening on the southern intersection approach as northbound through lanes north of Elm Point Industrial Drive will already be in place from the City's proposed improvements. A retaining wall would be required to accommodate the difference in grades. **Figure 5** illustrates a conceptual layout of the dual eastbound left-turns and dual northbound through lanes.

Dual Southbound to Eastbound Left Turn Lanes

As shown in Tables 2 and 3, the addition of a second southbound left-turn lane with (protected only phasing) could actually increase delay due to the ability to make permissive left-turns with a single lane. Moreover, the addition of a southbound dual left turn movement would result in significant impacts. The north leg of the intersection would need to be widened to accommodate dual turn lanes and the east leg would need to be widened to accommodate two receiving lanes. These improvements would result in impacts to adjacent properties (e.g., the gas station in the northeast quadrant). This alternative may also require widening on the south side of the intersection to align lanes along Elm Street. **Figure 6** illustrates a conceptual layout of the dual southbound left-turns lanes. For these reasons we do not recommend the construction of dual southbound to eastbound left turn lanes.

Table 2 : Capacity Analysis Comparison (Level of Service, Delay, V/C & 95th Percentile Queue)
2010 & 2030 Forecasted Traffic Volumes – AM PEAK HOUR
Intersection of Elm Street at Elm Point Industrial
St. Charles, Missouri

	2010 Proposed Design Conditions			2030 Proposed Design Conditions			2030 Proposed Design & Dual EB LT Conditions			2030 Proposed Design & Dual EB LT & 2 NB Thru Lane Condition			2030 Proposed Design & Dual EB LT & 2 NB Thru & Dual SB LT Condition			Two Lane Roundabout Alternative		
Movement	*LOS (Delay)*	*V/C Ratio*	*95th %tile Queue Length*	*LOS (Delay)*	*V/C Ratio*	*95th %tile Queue Length*	*LOS (Delay)*	*V/C Ratio*	*95th %tile Queue Length*	*LOS (Delay)*	*V/C Ratio*	*95th %tile Queue Length*	*LOS (Delay)*	*V/C Ratio*	*95th %tile Queue Length*	*LOS (Delay)*	*V/C Ratio*	*95th %tile Queue Length*
Elm Street at Elm Point Industrial (Signalized)																		
Eastbound Left-Turn	D (41.5)	0.81	#170	F (98.5)	1.06	#283	D (53.1)	0.79	#156	D (48.4)	0.74	#139	D (48.4)	0.74	# 139	B (18.0)	0.51	105
Eastbound Thru	C (25.3)	0.30	89	D (45.0)	0.69	202	D (48.4)	0.73	205	D (39.1)	0.62	192	D (44.2)	0.69	192	A (9.8)	0.51	105
Eastbound Right-Turn	A (8.9)	0.13	26	A (8.3)	0.29	42	A (8.7)	0.30	42	A (7.5)	0.26	40	A (7.9)	0.28	40	B (11.2)	0.51	105
Eastbound (Approach)	C (33.5)			E (64.9)			D (44.2)			D (38.5)			D (40.4)			B (14.0)	0.51	105
Westbound Left-Turn	B (16.4)	0.07	20	D (36.4)	0.63	118	C (32.0)	0.58	115	C (31.2)	0.57	111	C (27.5)	0.53	105	C (23.1)	0.58	124
Westbound Thru	C (32.2)	0.43	84	D (49.0)	0.69	174	D (49.0)	0.69	174	D (47.1)	0.67	172	D (44.5)	0.64	164	B (14.9)	0.58	130
Westbound Right-Turn	A (9.5)	0.28	33	A (9.3)	0.46	55	A (6.9)	0.46	55	A (9.0)	0.46	55	A (8.5)	0.45	52	B (15.8)	0.58	130
Westbound (Approach)	C (21.9)			C (31.7)			D (30.4)			C (29.4)			C (27.1)			C (17.7)	0.58	130
Northbound Left-Turn	A (8.3)	0.19	50	B (11.1)	0.31	70	B (11.6)	0.31	72	B (12.2)	0.30	76	B (12.5)	0.30	83	D (42.5)	0.96	475
Northbound Thru	C (27.6)	0.72	#406	E (61.4)	0.99	#608	E (70.2)	1.02	#620	C (24.8)	0.52	220	C (24.4)	0.51	220	C (34.3)	0.96	495
Northbound Right-Turn	A (4.4)	0.17	32	A (6.4)	0.45	82	A (6.9)	0.47	87	A (4.4)	0.43	58	A (4.4)	0.43	58	C (34.9)	0.96	495
Northbound (Approach)	C (21.1)			D (38.3)			D (43.6)			D (17.1)			B (16.9)			D (35.6)	0.96	495
Southbound Left-Turn	B (15.0)	0.56	100	D (53.8)	0.92	#369	D (52.6)	0.92	#369	C (26.1)	0.80	#255	D (46.2)	0.74	#189	B (15.9)	0.51	99
Southbound Thru	B (16.0)	0.29	145	B (17.1)	0.37	184	B (17.8)	0.38	188	B (19.0)	0.39	197	C (204)	0.40	209	A (8.1)	0.51	99
Southbound Right-Turn	A (4.5)	0.12	29	A (3.2)	0.16	30	A (3.4)	0.16	31	A (3.6)	0.17	32	A (4.0)	0.17	34	A (9.5)	0.51	99
Southbound (Approach)	B (13.6)			C (31.9)			C (31.6)			B (19.9)			C (29.8)			B (11.9)	0.51	99
Overall	C (21.8)			D (41.1)			D (38.4)			C (24.3)			C (26.8)			C (21.9)		

*Delay shown in Seconds per Vehicle
**Queue Length shown in Feet

Table 3 : Capacity Analysis Comparison (Level of Service, Delay, V/C & 95th Percentile Queue)
2010 & 2030 Forecasted Traffic Volumes – PM PEAK HOUR
Intersection of Elm Street at Elm Point Industrial
St. Charles, Missouri

	2010 Proposed Design Conditions			*2030 Proposed Design Conditions*			*2030 Proposed Design & Dual EB LT Conditions*			*2030 Proposed Design & Dual EB LT & 2 NB Thru Lane Condition*			*2030 Proposed Design & Dual EB LT & 2 NB Thru & Dual SB LT Condition*			*Two Lane Roundabout Alternative*		
Movement	*LOS (Delay)*	*V/C Ratio*	*95th %tile Queue Length*	*LOS (Delay)*	*V/C Ratio*	*95th %tile Queue Length*	*LOS (Delay)*	*V/C Ratio*	*95th %tile Queue Length*	*LOS (Delay)*	*V/C Ratio*	*95th %tile Queue Length*	*LOS (Delay)*	*V/C Ratio*	*95th %tile Queue Length*	*LOS (Delay)*	*V/C Ratio*	*95th %tile Queue Length*
Elm Street at Elm Point Industrial (Signalized)																		
Eastbound Left-Turn	C (31.7)	0.25	126	F (80.7)	0.98	#223	D (46.8)	0.67	118	D (44.6)	0.64	116	D (43.0)	0.61	114	D (35.7)	0.87	245
Eastbound Thru	C (30.1)	0.19	96	D (50.6)	0.75	#214	D (48.8)	0.73	#214	D (47.6)	0.72	#214	D (52.5)	0.78	#232	C (26.4)	0.87	260
Eastbound Right-Turn	A (8.4)	0.19	36	A (8.6)	0.47	57	A (8.5)	0.46	57	A (8.4)	0.46	57	A (8.8)	0.48	58	C (27.3)	0.87	260
Eastbound (Approach)	C (26.1)			D (49.9)			D (36.4)			D (35.1)			D (36.3)			D (30.2)	0.87	260
Westbound Left-Turn	B (19.4)	0.23	32	D (54.8)	0.82	#150	C (34.3)	0.66	137	C (29.2)	0.60	132	D (36.7)	0.69	#152	C (21.9)	0.75	165
Westbound Thru	C (34.3)	0.14	88	D (46.3)	0.66	174	D (44.7)	0.63	174	D (41.6)	0.59	172	D (52.8)	0.74	#207	B (14.2)	0.75	215
Westbound Right-Turn	A (9.7)	0.14	53	C (33.7)	0.90	#261	D (43.9)	0.94	#300	D (43.8)	0.94	#309	D (42.1)	0.76	280	B (16.6)	0.75	215
Westbound (Approach)	B (18.4)			D (41.3)			D (41.9)			D (40.0)			D (43.3)			C (17.3)	0.75	215
Northbound Left-Turn	A (8.5)	0.54	32	B (15.6)	0.46	50	B (19.9)	0.50	61	C (20.4)	0.50	62	C (20.2)	0.49	61	C (6.6)	0.67	170
Northbound Thru	B (18.9)	0.44	244	C (23.0)	0.61	333	C (26.7)	0.66	355	C (20.5)	0.36	153	B (19.7)	0.35	150	B (8.8)	0.67	175
Northbound Right-Turn	A (4.3)	0.44	26	A (3.1)	0.29	42	A (3.5)	0.31	44	A (3.8)	0.32	46	A (3.7)	0.31	45	B (8.8)	0.67	175
Northbound (Approach)	B (15.3)			B (16.4)			B (19.2)			B (15.7)			B (15.2)			C (14.3)	0.67	175
Southbound Left-Turn	A (9.0)	0.58	65	B (17.3)	0.69	126	C (23.9)	0.76	#165	B (17.4)	0.63	147	D (45.0)	0.67	131	C (23.4)	0.83	350
Southbound Thru	C (22.4)	0.49	#447	C (30.2)	0.84	#664	D (38.5)	0.90	#702	D (45.1)	0.94	#726	D (36.3)	0.88	# 689	B (15.6)	0.83	350
Southbound Right-Turn	A (3.2)	0.49	36	A (2.6)	0.23	36	A (3.2)	0.25	40	A (3.9)	0.26	45	A (3.0)	0.24	38	B (16.9)	0.83	350
Southbound (Approach)	B (16.4)			C (22.8)			C (29.4)			C (32.0)			C (32.9)			C (17.6)	0.83	350
Overall	B (18.2)			C (30.6)			C (31.3)			C (30.7)			C (31.9)			B (19.2)		

*Delay shown in Seconds per Vehicle
**Queue Length shown in Feet

Figure 5: Conceptual Layout of Dual Eastbound Left-Turns & Dual NB Thru Lanes

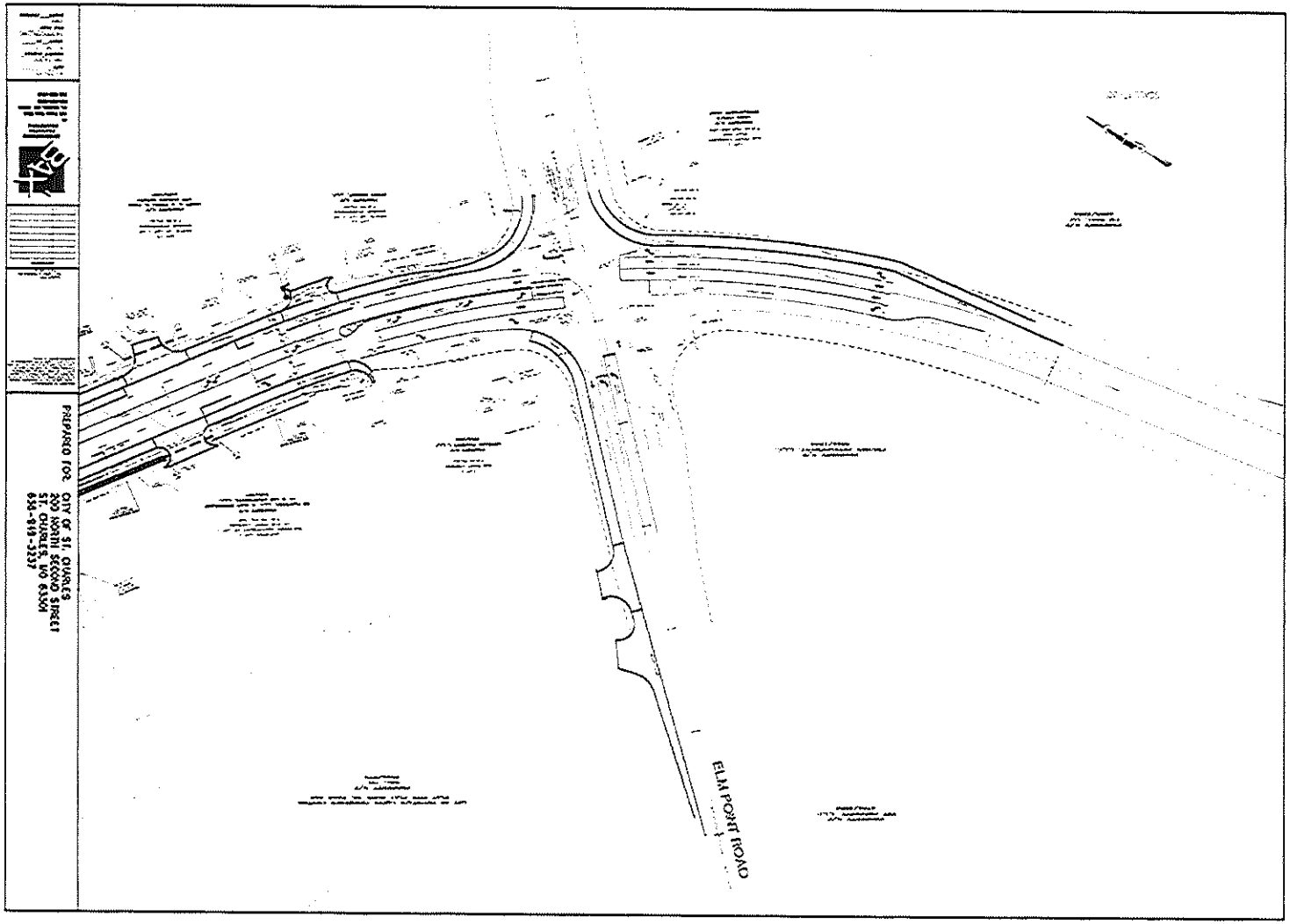
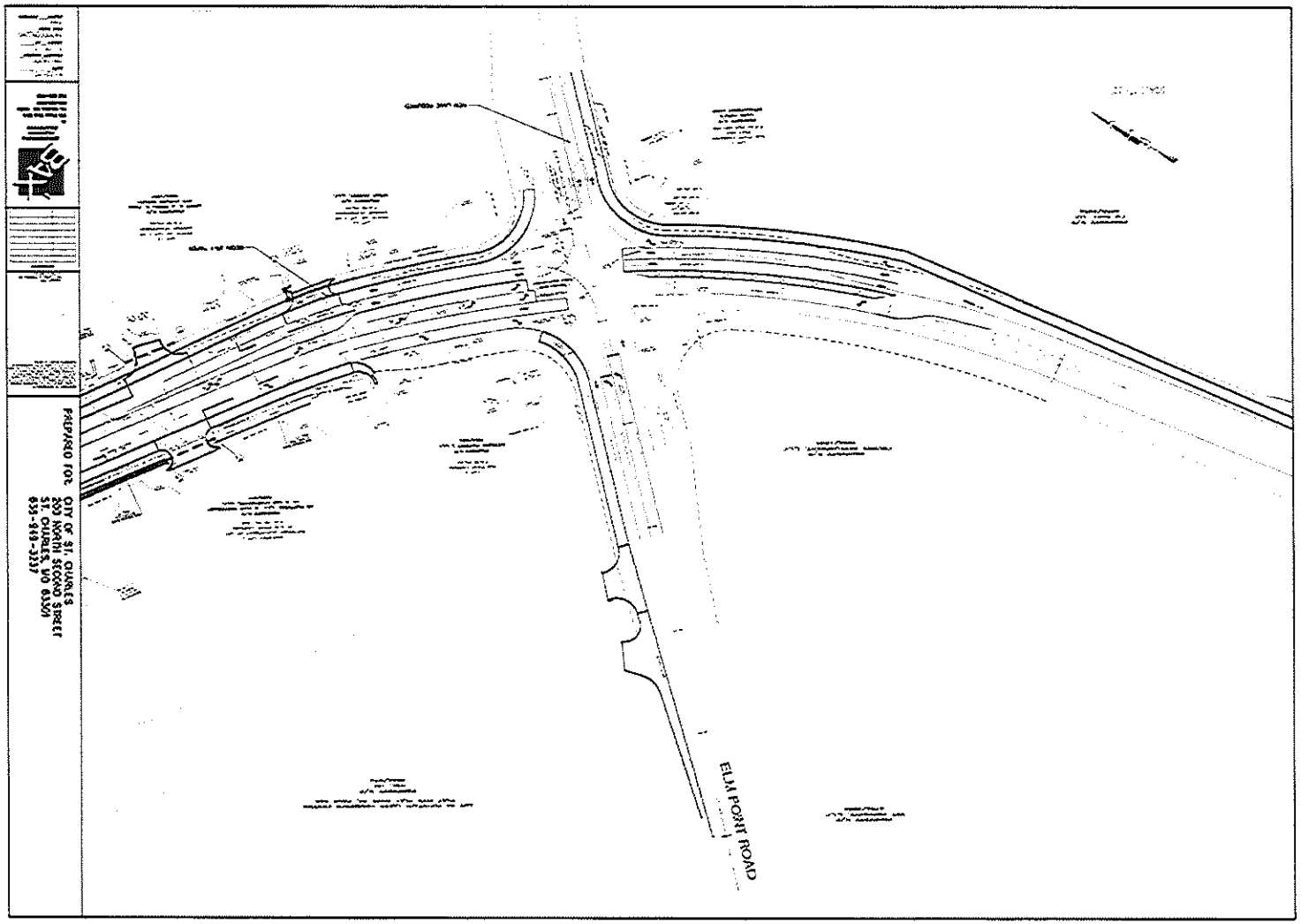


Figure 6: Conceptual Layout of Dual Southbound Left-Turn Lanes



Roundabout Alternative

As an alternative, a roundabout was also evaluated with the 2030 forecasted traffic volumes. The 2030 forecasted traffic volumes were analyzed using SIDRA Intersection, a traffic analysis program that is the most widely recognized tool available for evaluating roundabouts. This package also calculates vehicular delay times and operational levels of service, volume to capacity ratios and 95th percentile queue lengths that are consistent with methods supported by the "Highway Capacity Manual".

As can be seen in **Tables 2** and **3**, a dual-lane roundabout would operate at acceptable levels with the 2030 traffic volumes. However, it should be cautioned that the northbound approach is nearing capacity with a V/C ratio of 0.96 with 475 foot queues during the a.m. peak. The SIDRA analysis output sheets are attached in **Appendix C** of this report. It should be noted that several iterations of single lane with slip lanes and turbo roundabouts with and without slip lanes were evaluated, but the operating conditions remain poor unless a full two-lane roundabout is assumed.

Conceptual layouts were generated to illustrate the general footprint and show property impacts. It should be acknowledged that conceptual layouts or possible field constraints, such as right-of-way, grades, revised property access, etc, were not specifically addressed. **Figure 7** illustrates a conceptual layout of a typical 220-foot two-lane roundabout, while **Figure 8** illustrates a conceptual layout of the minimum 180-foot two-lane roundabout.

Figure 7: Conceptual Layout of Typical 220-Foot Two-Lane Roundabout

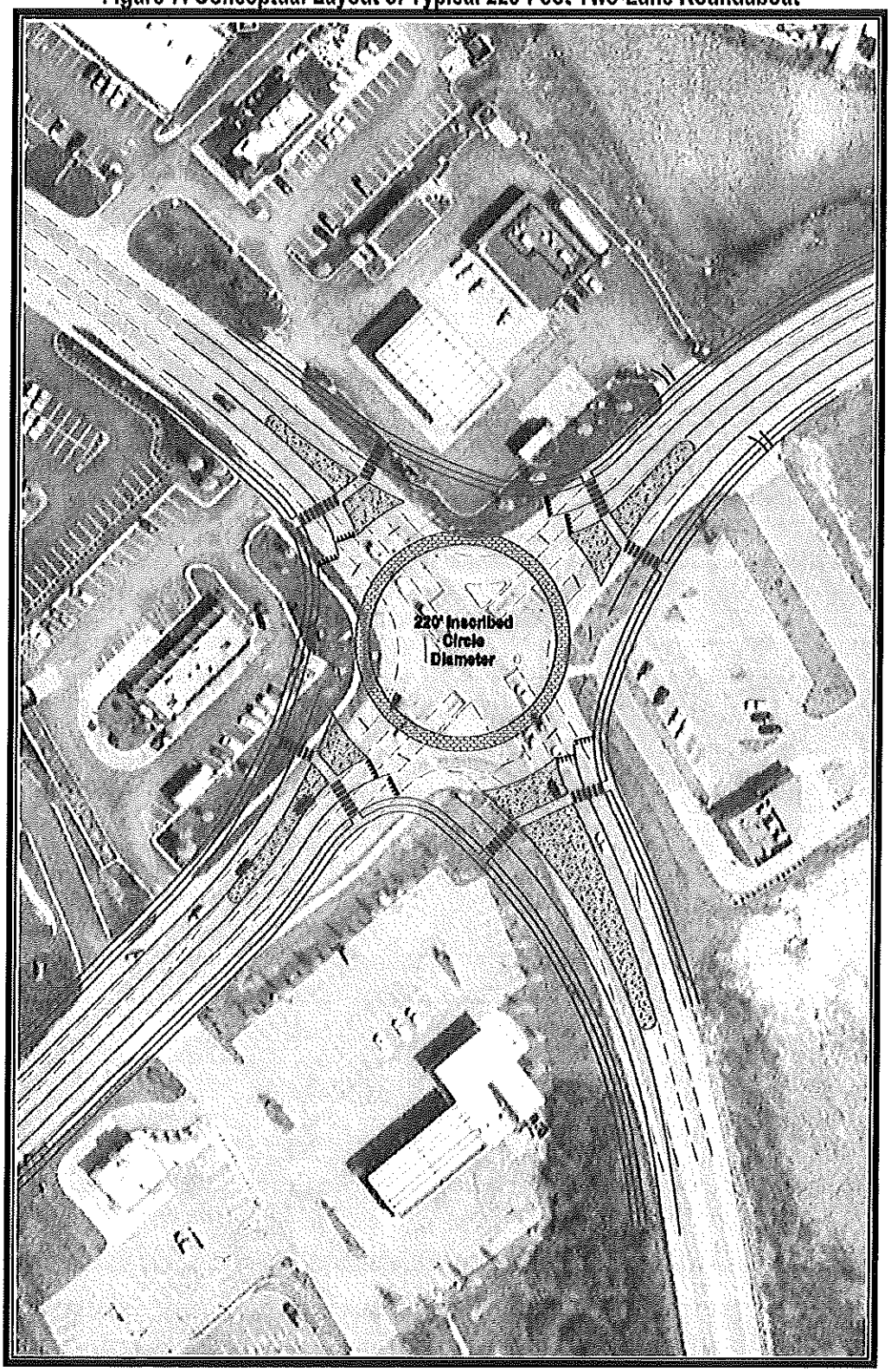
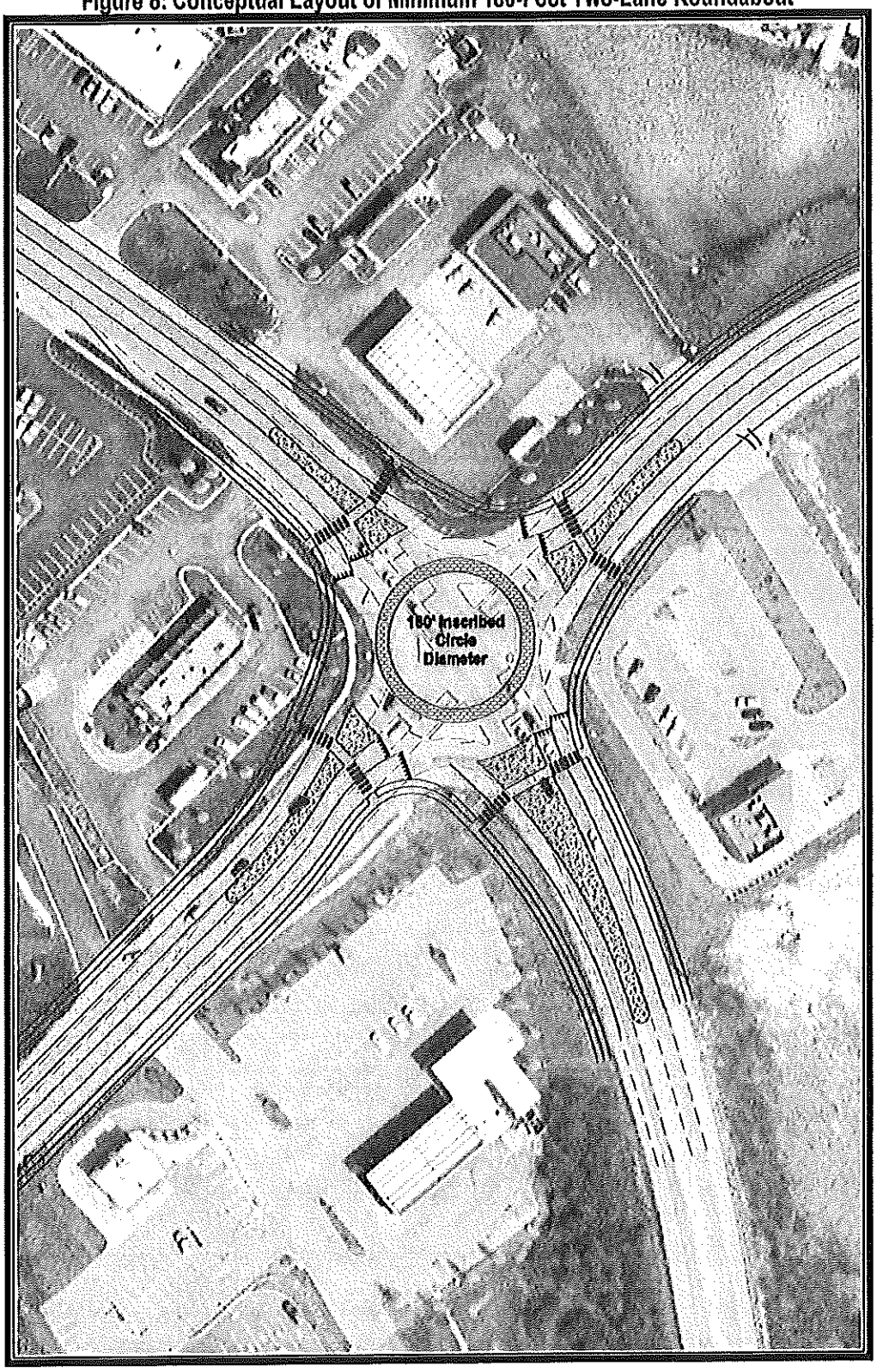


Figure 8: Conceptual Layout of Minimum 180-Foot Two-Lane Roundabout



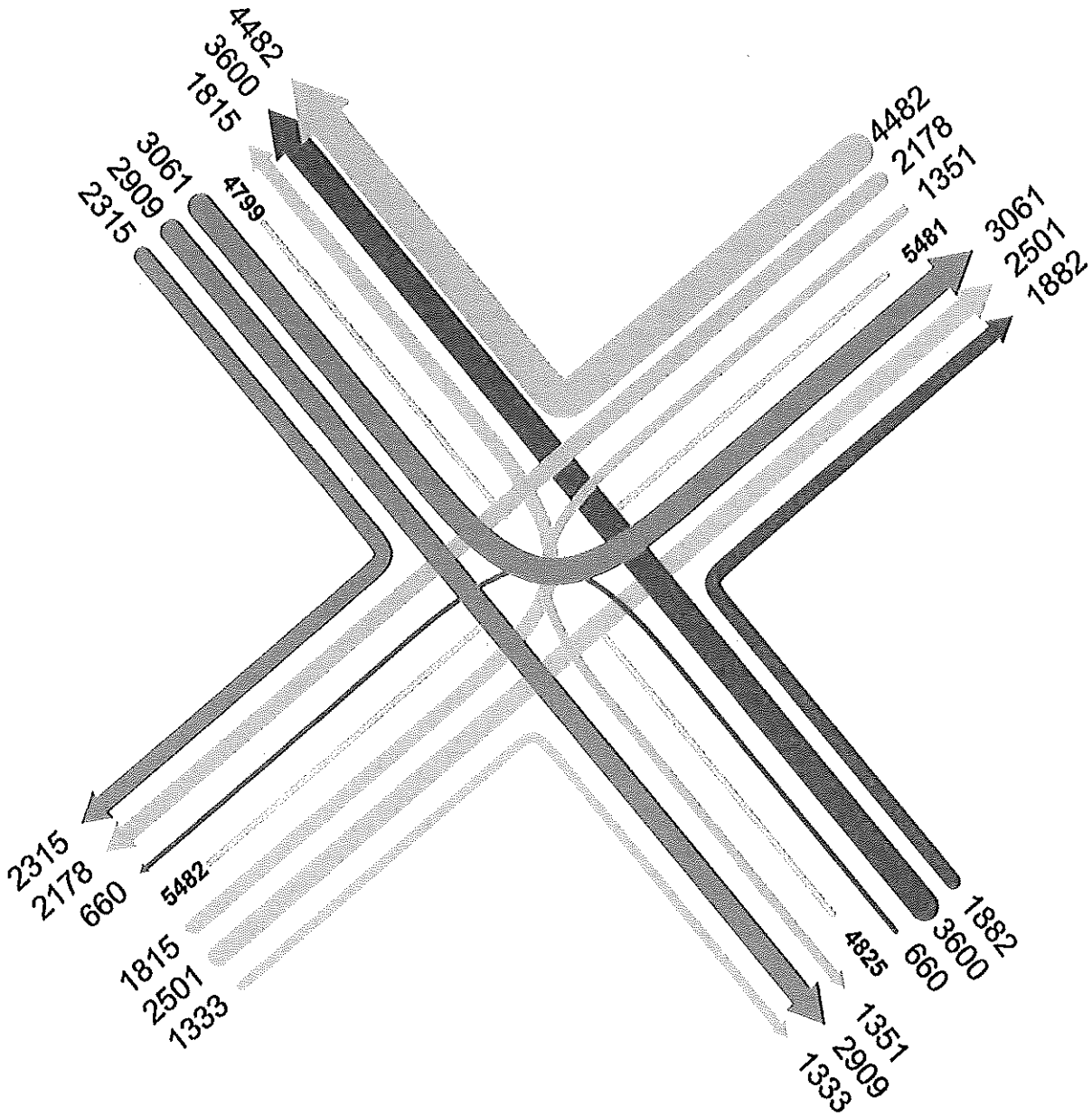
Conclusions

Based upon the preceding discussion, the following may be concluded regarding the traffic forecasts and operating conditions:

1. There is a need to add an eastbound left-turn land (dual left-turns) to accommodate the 2030 traffic forecasts. This improvement would likely not be required if the interchange at Zumbehl Road/Route 370 Interchange were constructed.
2. There is a need to provide a second northbound through lane to accommodate the 2030 traffic forecasts when the new connection is made to New Town (Walsh Court Extension).
3. There is not a need to provide an additional southbound left-turn lane (dual left-turns) to accommodate the 2030 traffic forecasts.
4. A full two-lane roundabout alternative would operate at overall acceptable levels, but would have significant impacts to the properties near the intersection to the larger footprint. However, the northbound approach would likely operate near capacity and have significant queues during the a.m. peak hour.

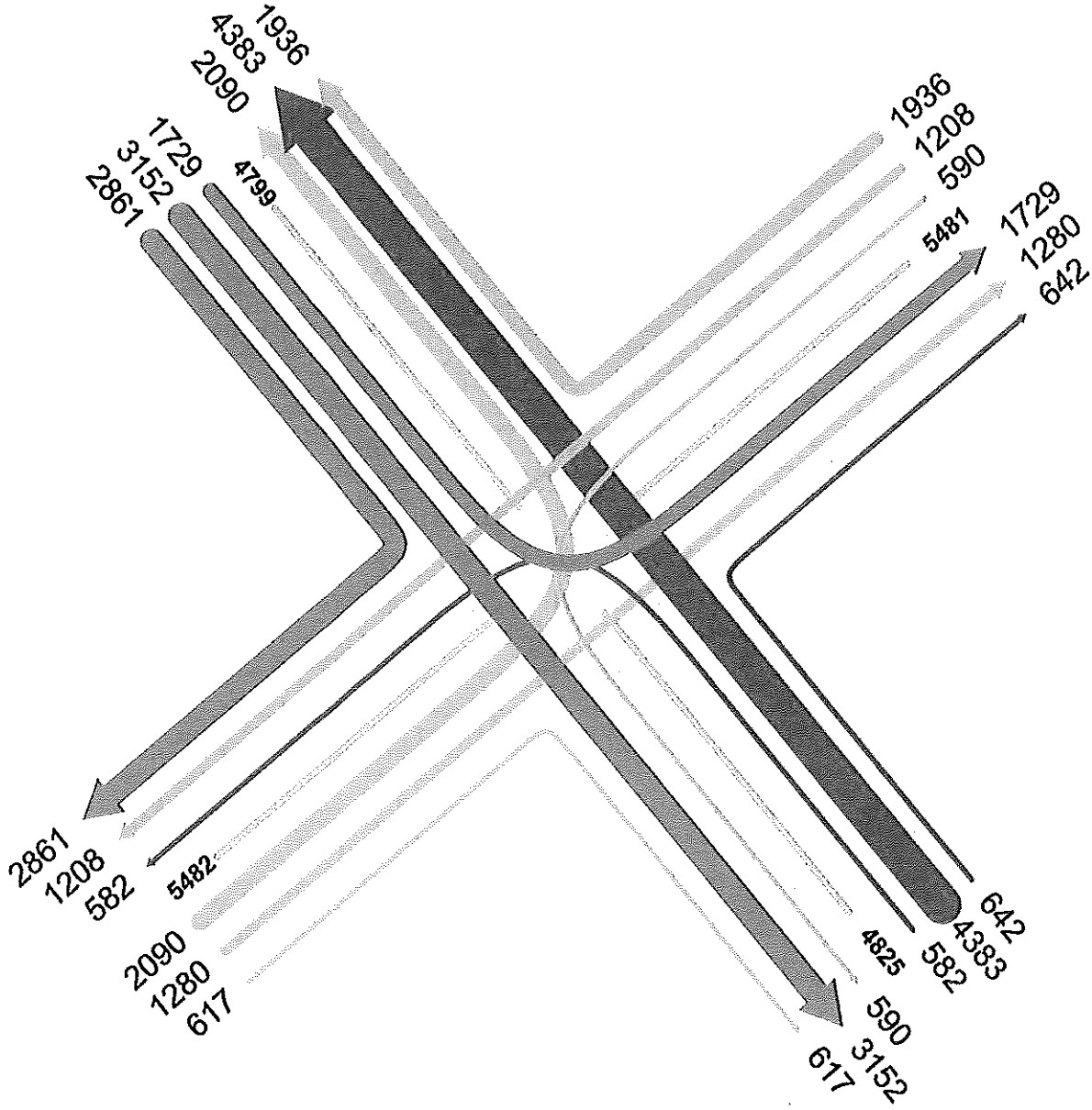
Appendix A: Travel Demand Outputs

Intersection Data View
Node Number : 4818
Intersection Type : Turn Flows Only;
Attribute : Volume 1



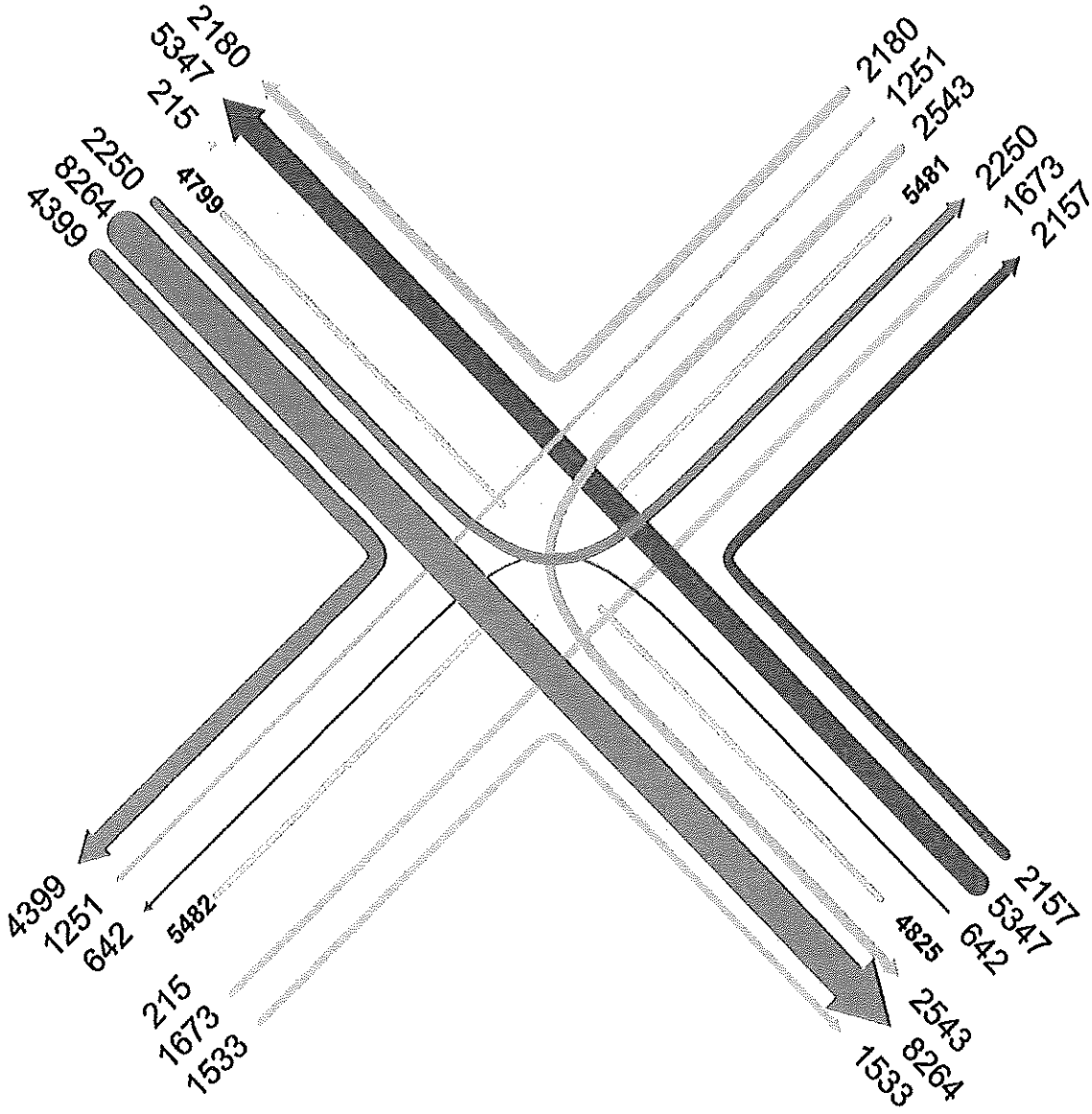
4/27/2010 1:34 PM C:\StCharlesModel\COUNTY MODEL_2023\Elm Final\OUTPUT.NET
Intersection Data: C:\StCharlesModel\COUNTY MODEL_2023\Elm Final\TURNVOLUMES.TRN.DBF

Intersection Data View
Node Number : 4818
Intersection Type : Turn Flows Only;
Attribute : Volume 1



4/27/2010 1:54 PM C:\StCharlesModel\COUNTY MODEL_2008\Rerun2008\OUTPUT.NET
Intersection Data: C:\StCharlesModel\COUNTY MODEL_2008\Rerun2008\TURNVOLUMES.TRN.DBF

Intersection Data View
Node Number : 4818
Intersection Type : Turn Flows Only;
Attribute : Volume 1



4/27/2010 1:56 PM C:\StCharlesModel\COUNTY MODEL_2050\OUTPUT.NET
Intersection Data: C:\StCharlesModel\COUNTY MODEL_2050\TURNVOLUMES.TRN.DBF

Appendix B: Synchro Outputs

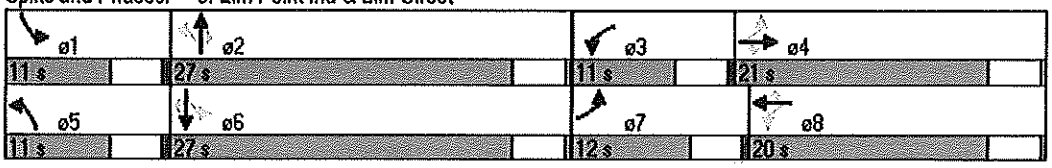
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	250	110	45	20	100	75	115	510	110	200	235	90
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	225		150	225		150	250		200	250		200
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (ft)	25		25	25		25	25		25	25		25
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.488			0.680			0.601			0.173		
Satd. Flow (perm)	909	1863	1583	1267	1863	1583	1120	1863	1583	322	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			49			82			120			98
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		865			940			707			546	
Travel Time (s)		19.7			21.4			16.1			12.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	272	120	49	22	109	82	125	554	120	217	255	98
Turn Type	pm+pt		Perm	pm+pt		Perm	pm+pt		Perm	pm+pt		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	10.0	10.0	7.0	10.0	10.0
Minimum Split (s)	11.0	21.0	21.0	11.0	20.0	20.0	11.0	20.0	20.0	11.0	20.0	20.0
Total Split (s)	12.0	21.0	21.0	11.0	20.0	20.0	11.0	27.0	27.0	11.0	27.0	27.0
Total Split (%)	17.1%	30.0%	30.0%	15.7%	28.6%	28.6%	15.7%	38.6%	38.6%	15.7%	38.6%	38.6%
Maximum Green (s)	8.0	17.0	17.0	7.0	16.0	16.0	7.0	23.0	23.0	7.0	23.0	23.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)	18.2	15.0	15.0	15.2	9.6	9.6	36.9	28.8	28.8	41.0	32.7	32.7
Actuated g/C Ratio	0.26	0.21	0.21	0.22	0.14	0.14	0.53	0.41	0.41	0.59	0.47	0.47
v/c Ratio	0.81	0.30	0.13	0.07	0.43	0.28	0.19	0.72	0.17	0.56	0.29	0.12
Control Delay	41.5	25.3	8.9	16.4	32.2	9.5	8.3	27.6	4.4	15.0	16.0	4.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	41.5	25.3	8.9	16.4	32.2	9.5	8.3	27.6	4.4	15.0	16.0	4.5
LOS	D	C	A	B	C	A	A	C	A	B	B	A
Approach Delay		33.5			21.9			21.1			13.6	
Approach LOS		C			C			C			B	
Queue Length 50th (ft)	95	38	0	7	44	0	22	207	0	40	72	0
Queue Length 95th (ft)	#170	89	26	20	84	33	50	#406	32	100	145	29
Internal Link Dist (ft)		785			860			627			466	
Turn Bay Length (ft)	225		150	225		150	250		200	250		200
Base Capacity (vph)	335	492	454	326	426	425	666	767	723	390	870	791

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.81	0.24	0.11	0.07	0.26	0.19	0.19	0.72	0.17	0.56	0.29	0.12

Intersection Summary

Area Type: Other
Cycle Length: 70
Actuated Cycle Length: 70
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 70
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.81
Intersection Signal Delay: 21.8 Intersection LOS: C
Intersection Capacity Utilization 68.4% ICU Level of Service C
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: Elm Point Ind & Elm Street



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	300	220	100	150	180	170	150	620	320	360	300	120
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	225		150	225		150	250		200	250		0
Storage Lanes	1		1	1		1	1		1	1		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.318			0.422			0.563			0.108		
Satd. Flow (perm)	592	1863	1583	786	1863	1583	1049	1863	1583	201	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			109			185			293			130
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		865			940			707			546	
Travel Time (s)		19.7			21.4			16.1			12.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	326	239	109	163	196	185	163	674	348	391	326	130
Turn Type	pm+pt		Perm	pm+pt		Perm	pm+pt		Perm	pm+pt		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	10.0	10.0	7.0	10.0	10.0
Minimum Split (s)	11.0	21.0	21.0	11.0	20.0	20.0	11.0	20.0	20.0	11.0	20.0	20.0
Total Split (s)	14.0	23.0	23.0	11.0	20.0	20.0	11.0	37.0	37.0	19.0	45.0	45.0
Total Split (%)	15.6%	25.6%	25.6%	12.2%	22.2%	22.2%	12.2%	41.1%	41.1%	21.1%	50.0%	50.0%
Maximum Green (s)	10.0	19.0	19.0	7.0	16.0	16.0	7.0	33.0	33.0	15.0	41.0	41.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)	26.7	16.7	16.7	20.7	13.7	13.7	40.5	33.0	33.0	54.3	42.8	42.8
Actuated g/C Ratio	0.30	0.19	0.19	0.23	0.15	0.15	0.45	0.37	0.37	0.60	0.48	0.48
v/c Ratio	1.06	0.69	0.29	0.63	0.69	0.46	0.31	0.99	0.45	0.92	0.37	0.16
Control Delay	98.5	45.0	8.4	36.4	49.0	9.3	11.1	61.4	6.4	53.8	17.1	3.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	98.5	45.0	8.4	36.4	49.0	9.3	11.1	61.4	6.4	53.8	17.1	3.2
LOS	F	D	A	D	D	A	B	E	A	D	B	A
Approach Delay		64.9			31.7			38.3			31.9	
Approach LOS		E			C			D			C	
Queue Length 50th (ft)	~163	126	0	69	106	0	38	374	20	169	118	0
Queue Length 95th (ft)	#283	202	42	118	174	55	70	#608	82	#369	184	30
Internal Link Dist (ft)		785			860			627			466	
Turn Bay Length (ft)	225		150	225		150	250		200	250		
Base Capacity (vph)	307	393	420	257	331	434	532	683	766	423	887	822

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.06	0.61	0.26	0.63	0.59	0.43	0.31	0.99	0.45	0.92	0.37	0.16

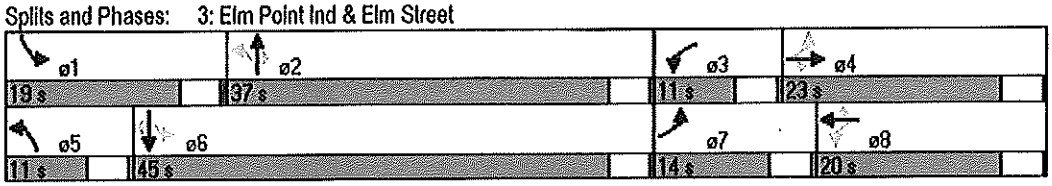
Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.06
Intersection Signal Delay: 41.1 Intersection LOS: D
Intersection Capacity Utilization 92.0% ICU Level of Service F
Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: Elm Point Ind & Elm Street



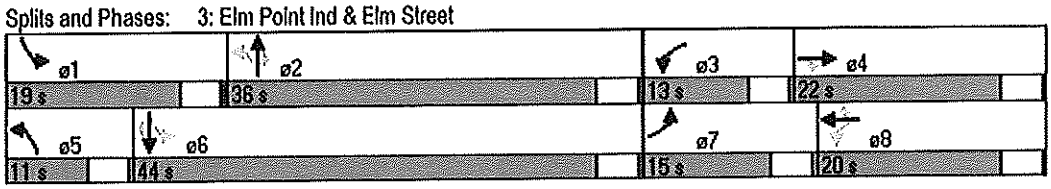
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	300	220	100	150	180	170	150	620	320	360	300	120
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	225		150	225		150	250		200	250		0
Storage Lanes	2		1	1		1	1		1	1		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Satd. Flow (prot)	3433	1863	1583	1770	1863	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.950			0.376			0.563			0.111		
Satd. Flow (perm)	3433	1863	1583	700	1863	1583	1049	1863	1583	207	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			109			185			288			130
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		865			940			707			546	
Travel Time (s)		19.7			21.4			16.1			12.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	326	239	109	163	196	185	163	674	348	391	326	130
Turn Type	Prot		Perm	pm+pt		Perm	pm+pt		Perm	pm+pt		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4	8		8	2		2	6		6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	10.0	10.0	7.0	10.0	10.0
Minimum Split (s)	11.0	21.0	21.0	11.0	20.0	20.0	11.0	20.0	20.0	11.0	20.0	20.0
Total Split (s)	15.0	22.0	22.0	13.0	20.0	20.0	11.0	36.0	36.0	19.0	44.0	44.0
Total Split (%)	16.7%	24.4%	24.4%	14.4%	22.2%	22.2%	12.2%	40.0%	40.0%	21.1%	48.9%	48.9%
Maximum Green (s)	11.0	18.0	18.0	9.0	16.0	16.0	7.0	32.0	32.0	15.0	40.0	40.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)	10.9	15.8	15.8	22.4	13.7	13.7	39.5	32.0	32.0	53.4	41.9	41.9
Actuated g/C Ratio	0.12	0.18	0.18	0.25	0.15	0.15	0.44	0.36	0.36	0.59	0.47	0.47
v/c Ratio	0.79	0.73	0.30	0.58	0.69	0.46	0.31	1.02	0.47	0.92	0.38	0.16
Control Delay	53.1	48.4	8.7	32.0	49.0	9.3	11.6	70.2	6.9	52.6	17.8	3.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	53.1	48.4	8.7	32.0	49.0	9.3	11.6	70.2	6.9	52.6	17.8	3.4
LOS	D	D	A	C	D	A	B	E	A	D	B	A
Approach Delay		44.2			30.4			43.6			31.6	
Approach LOS		D			C			D			C	
Queue Length 50th (ft)	94	128	0	68	106	0	39	~392	23	169	121	0
Queue Length 95th (ft)	#156	205	42	115	174	55	72	#620	87	#369	188	31
Internal Link Dist (ft)		785			860			627			466	
Turn Bay Length (ft)	225		150	225		150	250		200	250		
Base Capacity (vph)	420	373	404	283	331	434	521	662	748	426	868	807

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.78	0.64	0.27	0.58	0.59	0.43	0.31	1.02	0.47	0.92	0.38	0.16

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.02
Intersection Signal Delay: 38.4 Intersection LOS: D
Intersection Capacity Utilization 85.8% ICU Level of Service E
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: Elm Point Ind & Elm Street



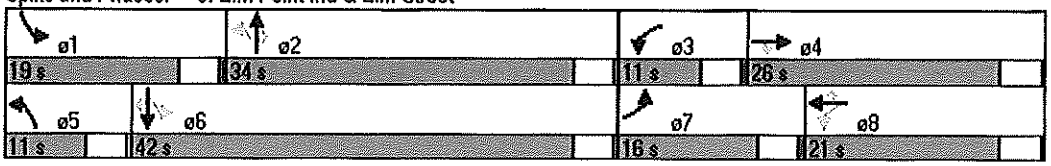
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	300	220	100	150	180	170	150	620	320	360	300	120
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	225		150	225		150	250		200	250		0
Storage Lanes	2		1	1		1	1		1	1		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Satd. Flow (prot)	3433	1863	1583	1770	1863	1583	1770	3539	1583	1770	1863	1583
Flt Permitted	0.950			0.510			0.563			0.247		
Satd. Flow (perm)	3433	1863	1583	950	1863	1583	1049	3539	1583	460	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			109			185			348			130
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		865			940			707			546	
Travel Time (s)		19.7			21.4			16.1			12.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	326	239	109	163	196	185	163	674	348	391	326	130
Turn Type	Prot		Perm	pm+pt		Perm	pm+pt		Perm	pm+pt		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4	8		8	2		2	6		6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	10.0	10.0	7.0	10.0	10.0
Minimum Split (s)	11.0	21.0	21.0	11.0	20.0	20.0	11.0	20.0	20.0	11.0	20.0	20.0
Total Split (s)	16.0	26.0	26.0	11.0	21.0	21.0	11.0	34.0	34.0	19.0	42.0	42.0
Total Split (%)	17.8%	28.9%	28.9%	12.2%	23.3%	23.3%	12.2%	37.8%	37.8%	21.1%	46.7%	46.7%
Maximum Green (s)	12.0	22.0	22.0	7.0	17.0	17.0	7.0	30.0	30.0	15.0	38.0	38.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)	11.6	18.7	18.7	21.1	14.1	14.1	40.9	33.2	33.2	52.3	40.6	40.6
Actuated g/C Ratio	0.13	0.21	0.21	0.23	0.16	0.16	0.45	0.37	0.37	0.58	0.45	0.45
v/c Ratio	0.74	0.62	0.26	0.57	0.67	0.46	0.30	0.52	0.43	0.80	0.39	0.17
Control Delay	48.4	39.1	7.5	31.2	47.1	9.0	12.2	24.8	4.4	26.1	19.0	3.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	48.4	39.1	7.5	31.2	47.1	9.0	12.2	24.8	4.4	26.1	19.0	3.6
LOS	D	D	A	C	D	A	B	C	A	C	B	A
Approach Delay		38.5			29.4			17.1			19.9	
Approach LOS		D			C			B			B	
Queue Length 50th (ft)	92	123	0	67	106	0	41	164	0	114	126	0
Queue Length 95th (ft)	#139	192	40	111	172	55	76	220	58	#255	197	32
Internal Link Dist (ft)		785			860			627			466	
Turn Bay Length (ft)	225		150	225		150	250		200	250		
Base Capacity (vph)	458	455	469	286	352	449	539	1306	804	495	841	785

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.71	0.53	0.23	0.57	0.56	0.41	0.30	0.52	0.43	0.79	0.39	0.17

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.80
Intersection Signal Delay: 24.3 Intersection LOS: C
Intersection Capacity Utilization 70.3% ICU Level of Service C
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: Elm Point Ind & Elm Street



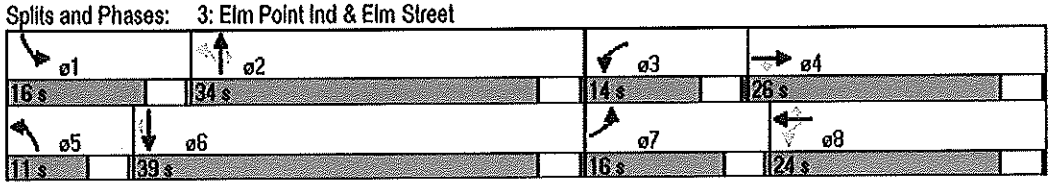
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	300	220	100	150	180	170	150	620	320	360	300	120
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	225		150	225		150	250		200	250		0
Storage Lanes	2		1	1		1	1		1	2		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Satd. Flow (prot)	3433	1863	1583	1770	1863	1583	1770	3539	1583	3433	1863	1583
Flt Permitted	0.950			0.395			0.536			0.950		
Satd. Flow (perm)	3433	1863	1583	736	1863	1583	998	3539	1583	3433	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			109			185			348			130
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		865			940			707			546	
Travel Time (s)		19.7			21.4			16.1			12.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	326	239	109	163	196	185	163	674	348	391	326	130
Turn Type	Prot		Perm	pm+pt		Perm	pm+pt		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4	8		8	2		2			6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	10.0	10.0	7.0	10.0	10.0
Minimum Split (s)	11.0	21.0	21.0	11.0	20.0	20.0	11.0	20.0	20.0	11.0	20.0	20.0
Total Split (s)	16.0	26.0	26.0	14.0	24.0	24.0	11.0	34.0	34.0	16.0	39.0	39.0
Total Split (%)	17.8%	28.9%	28.9%	15.6%	26.7%	26.7%	12.2%	37.8%	37.8%	17.8%	43.3%	43.3%
Maximum Green (s)	12.0	22.0	22.0	10.0	20.0	20.0	7.0	30.0	30.0	12.0	35.0	35.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)	11.6	16.8	16.8	24.3	14.7	14.7	42.0	33.7	33.7	13.9	39.4	39.4
Actuated g/C Ratio	0.13	0.19	0.19	0.27	0.16	0.16	0.47	0.37	0.37	0.15	0.44	0.44
v/c Ratio	0.74	0.69	0.28	0.53	0.64	0.45	0.30	0.51	0.43	0.74	0.40	0.17
Control Delay	48.4	44.2	7.9	27.5	44.5	8.5	12.5	24.4	4.4	46.2	20.4	4.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	48.4	44.2	7.9	27.5	44.5	8.5	12.5	24.4	4.4	46.2	20.4	4.0
LOS	D	D	A	C	D	A	B	C	A	D	C	A
Approach Delay		40.4			27.1			16.9			29.8	
Approach LOS		D			C			B			C	
Queue Length 50th (ft)	92	128	0	67	105	0	41	160	0	107	126	0
Queue Length 95th (ft)	#139	192	40	105	164	52	83	220	58	#189	209	34
Internal Link Dist (ft)		785			860			627			466	
Turn Bay Length (ft)	225		150	225		150	250		200	250		
Base Capacity (vph)	458	455	469	317	414	496	537	1327	811	531	815	766

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.71	0.53	0.23	0.51	0.47	0.37	0.30	0.51	0.43	0.74	0.40	0.17

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.74
Intersection Signal Delay: 26.8 Intersection LOS: C
Intersection Capacity Utilization 60.6% ICU Level of Service B
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: Elm Point Ind & Elm Street



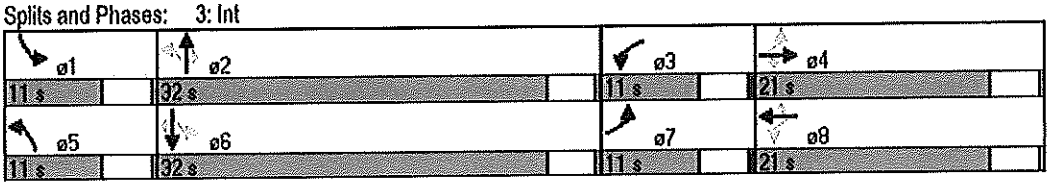
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	190	110	85	35	100	190	70	385	80	160	575	175
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	225		150	225		150	250		200	250		200
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (ft)	25		25	25		25	25		25	25		25
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.552			0.680			0.223			0.340		
Satd. Flow (perm)	1028	1863	1583	1267	1863	1583	415	1863	1583	633	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			92			207			87			190
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		865			940			707			546	
Travel Time (s)		19.7			21.4			16.1			12.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	207	120	92	38	109	207	76	418	87	174	625	190
Turn Type	pm+pt		Perm	pm+pt		Perm	pm+pt		Perm	pm+pt		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	10.0	10.0	7.0	10.0	10.0
Minimum Split (s)	11.0	21.0	21.0	11.0	20.0	20.0	11.0	20.0	20.0	11.0	20.0	20.0
Total Split (s)	11.0	21.0	21.0	11.0	21.0	21.0	11.0	32.0	32.0	11.0	32.0	32.0
Total Split (%)	14.7%	28.0%	28.0%	14.7%	28.0%	28.0%	14.7%	42.7%	42.7%	14.7%	42.7%	42.7%
Maximum Green (s)	7.0	17.0	17.0	7.0	17.0	17.0	7.0	28.0	28.0	7.0	28.0	28.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)	18.8	14.6	14.6	17.2	10.2	10.2	40.6	33.2	33.2	43.8	36.6	36.6
Actuated g/C Ratio	0.25	0.19	0.19	0.23	0.14	0.14	0.54	0.44	0.44	0.58	0.49	0.49
v/c Ratio	0.63	0.33	0.24	0.11	0.43	0.53	0.21	0.51	0.12	0.35	0.69	0.22
Control Delay	31.7	30.1	8.4	19.4	34.3	9.7	8.5	18.9	4.4	9.0	22.4	3.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	31.7	30.1	8.4	19.4	34.3	9.7	8.5	18.9	4.4	9.0	22.4	3.2
LOS	C	C	A	B	C	A	A	B	A	A	C	A
Approach Delay		26.1			18.4			15.3			16.4	
Approach LOS		C			B			B			B	
Queue Length 50th (ft)	78	52	0	13	47	0	13	134	0	31	223	0
Queue Length 95th (ft)	126	96	36	32	88	53	32	244	26	65	#447	36
Internal Link Dist (ft)		785			860			627			466	
Turn Bay Length (ft)	225		150	225		150	250		200	250		200
Base Capacity (vph)	327	438	443	337	422	519	358	825	749	501	910	870

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.63	0.27	0.21	0.11	0.26	0.40	0.21	0.51	0.12	0.35	0.69	0.22

Intersection Summary

Area Type: Other
Cycle Length: 75
Actuated Cycle Length: 75
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 75
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.69
Intersection Signal Delay: 18.2 Intersection LOS: B
Intersection Capacity Utilization 63.3% ICU Level of Service B
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: Int



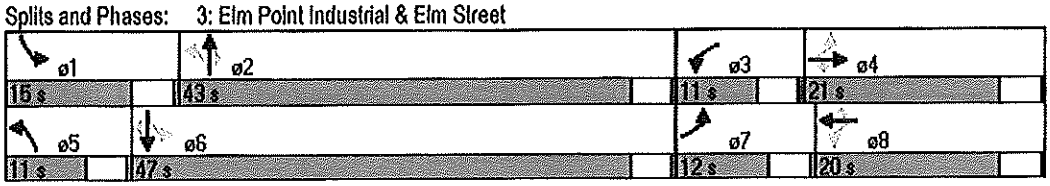
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	250	220	190	180	180	440	100	475	230	290	750	200
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	225		150	225		150	250		200	250		0
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (ft)	25		25	25		25	25		25	25		25
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.377			0.338			0.119			0.265		
Satd. Flow (perm)	702	1863	1583	630	1863	1583	222	1863	1583	494	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			207			330			250			217
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		865			940			707			546	
Travel Time (s)		19.7			21.4			16.1			12.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	272	239	207	196	196	478	109	516	250	315	815	217
Turn Type	pm+pt		Perm	pm+pt		Perm	pm+pt		Perm	pm+pt		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	10.0	10.0	7.0	10.0	10.0
Minimum Split (s)	11.0	21.0	21.0	11.0	20.0	20.0	11.0	20.0	20.0	11.0	20.0	20.0
Total Split (s)	12.0	21.0	21.0	11.0	20.0	20.0	11.0	43.0	43.0	15.0	47.0	47.0
Total Split (%)	13.3%	23.3%	23.3%	12.2%	22.2%	22.2%	12.2%	47.8%	47.8%	16.7%	52.2%	52.2%
Maximum Green (s)	8.0	17.0	17.0	7.0	16.0	16.0	7.0	39.0	39.0	11.0	43.0	43.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)	23.4	15.4	15.4	21.4	14.4	14.4	47.9	40.9	40.9	55.6	46.8	46.8
Actuated g/C Ratio	0.26	0.17	0.17	0.24	0.16	0.16	0.53	0.45	0.45	0.62	0.52	0.52
v/c Ratio	0.98	0.75	0.47	0.82	0.66	0.90	0.46	0.61	0.29	0.69	0.84	0.23
Control Delay	80.7	50.6	8.6	54.8	46.3	33.7	15.6	23.0	3.1	17.3	30.2	2.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	80.7	50.6	8.6	54.8	46.3	33.7	15.6	23.0	3.1	17.3	30.2	2.6
LOS	F	D	A	D	D	C	B	C	A	B	C	A
Approach Delay		49.9			41.3			16.4			22.8	
Approach LOS		D			D			B			C	
Queue Length 50th (ft)	125	128	0	86	104	81	24	223	0	80	413	0
Queue Length 95th (ft)	#223	#214	57	#150	174	#261	50	333	42	126	#664	36
Internal Link Dist (ft)		785			860			627			466	
Turn Bay Length (ft)	225		150	225		150	250		200	250		
Base Capacity (vph)	277	352	467	239	331	553	239	847	856	462	969	928

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.98	0.68	0.44	0.82	0.59	0.86	0.46	0.61	0.29	0.68	0.84	0.23

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.98
Intersection Signal Delay: 30.6 Intersection LOS: C
Intersection Capacity Utilization 82.0% ICU Level of Service D
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: Elm Point Industrial & Elm Street



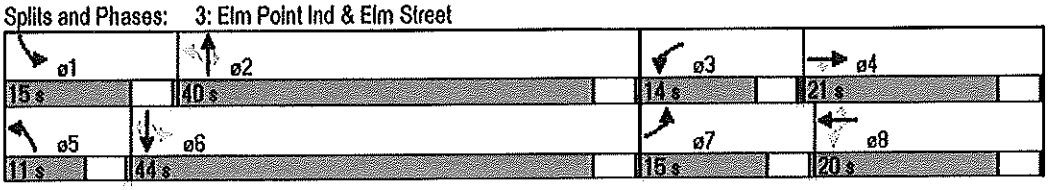
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	250	220	190	180	180	440	100	475	230	290	750	200
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	225		150	225		150	250		200	250		0
Storage Lanes	2		1	1		1	1		1	1		1
Taper Length (ft)	25		25	25		25	25		25	25		25
Satd. Flow (prot)	3433	1863	1583	1770	1863	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.950			0.346			0.106			0.236		
Satd. Flow (perm)	3433	1863	1583	645	1863	1583	197	1863	1583	440	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			207			292			250			211
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		865			940			707			546	
Travel Time (s)		19.7			21.4			16.1			12.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	272	239	207	196	196	478	109	516	250	315	815	217
Turn Type	Prot		Perm	pm+pt		Perm	pm+pt		Perm	pm+pt		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4	8		8	2		2	6		6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	10.0	10.0	7.0	10.0	10.0
Minimum Split (s)	11.0	21.0	21.0	11.0	20.0	20.0	11.0	20.0	20.0	11.0	20.0	20.0
Total Split (s)	15.0	21.0	21.0	14.0	20.0	20.0	11.0	40.0	40.0	15.0	44.0	44.0
Total Split (%)	16.7%	23.3%	23.3%	15.6%	22.2%	22.2%	12.2%	44.4%	44.4%	16.7%	48.9%	48.9%
Maximum Green (s)	11.0	17.0	17.0	10.0	16.0	16.0	7.0	36.0	36.0	11.0	40.0	40.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)	10.6	15.8	15.8	24.7	14.9	14.9	44.7	37.7	37.7	52.5	43.7	43.7
Actuated g/C Ratio	0.12	0.18	0.18	0.27	0.17	0.17	0.50	0.42	0.42	0.58	0.49	0.49
v/c Ratio	0.67	0.73	0.46	0.66	0.63	0.94	0.50	0.66	0.31	0.76	0.90	0.25
Control Delay	46.8	48.8	8.5	34.3	44.7	43.9	19.9	26.7	3.5	23.9	38.5	3.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	46.8	48.8	8.5	34.3	44.7	43.9	19.9	26.7	3.5	23.9	38.5	3.2
LOS	D	D	A	C	D	D	B	C	A	C	D	A
Approach Delay		36.4			41.9			19.2			29.4	
Approach LOS		D			D			B			C	
Queue Length 50th (ft)	77	128	0	81	104	108	27	238	0	88	443	2
Queue Length 95th (ft)	118	#214	57	137	174	#300	61	355	44	#165	#702	40
Internal Link Dist (ft)		785			860			627			466	
Turn Bay Length (ft)	225		150	225		150	250		200	250		
Base Capacity (vph)	420	352	467	303	331	522	220	781	809	419	904	877

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.65	0.68	0.44	0.65	0.59	0.92	0.50	0.66	0.31	0.75	0.90	0.25

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.94
Intersection Signal Delay: 31.3 Intersection LOS: C
Intersection Capacity Utilization 80.2% ICU Level of Service D
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: Elm Point Ind & Elm Street



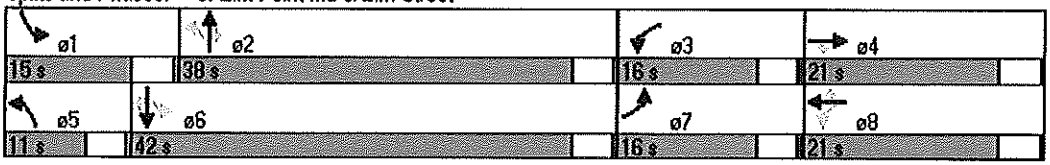
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	250	220	190	180	180	440	100	475	230	290	750	200
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	225		150	225		150	250		200	250		0
Storage Lanes	2		1	1		1	1		1	1		1
Taper Length (ft)	25		25	25		25	25		25	25		25
Satd. Flow (prot)	3433	1863	1583	1770	1863	1583	1770	3539	1583	1770	1863	1583
Flt Permitted	0.950			0.335			0.110			0.352		
Satd. Flow (perm)	3433	1863	1583	624	1863	1583	205	3539	1583	656	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			207			277			250			203
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		865			940			707			546	
Travel Time (s)		19.7			21.4			16.1			12.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	272	239	207	196	196	478	109	516	250	315	815	217
Turn Type	Prot		Perm	pm+pt		Perm	pm+pt		Perm	pm+pt		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4	8		8	2		2	6		6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	10.0	10.0	7.0	10.0	10.0
Minimum Split (s)	11.0	21.0	21.0	11.0	20.0	20.0	11.0	20.0	20.0	11.0	20.0	20.0
Total Split (s)	16.0	21.0	21.0	16.0	21.0	21.0	11.0	38.0	38.0	15.0	42.0	42.0
Total Split (%)	17.8%	23.3%	23.3%	17.8%	23.3%	23.3%	12.2%	42.2%	42.2%	16.7%	46.7%	46.7%
Maximum Green (s)	12.0	17.0	17.0	12.0	17.0	17.0	7.0	34.0	34.0	11.0	38.0	38.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)	11.2	16.1	16.1	27.1	16.0	16.0	43.2	36.2	36.2	50.8	42.0	42.0
Actuated g/C Ratio	0.12	0.18	0.18	0.30	0.18	0.18	0.48	0.40	0.40	0.56	0.47	0.47
v/c Ratio	0.64	0.72	0.46	0.60	0.59	0.94	0.50	0.36	0.32	0.63	0.94	0.26
Control Delay	44.6	47.6	8.4	29.2	41.6	43.8	20.4	20.5	3.8	17.4	45.1	3.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	44.6	47.6	8.4	29.2	41.6	43.8	20.4	20.5	3.8	17.4	45.1	3.9
LOS	D	D	A	C	D	D	C	C	A	B	D	A
Approach Delay		35.1			40.0			15.7			32.0	
Approach LOS		D			D			B			C	
Queue Length 50th (ft)	76	128	0	78	102	118	28	110	0	93	~504	5
Queue Length 95th (ft)	116	#214	57	132	172	#309	62	153	46	147	#726	45
Internal Link Dist (ft)		785			860			627			466	
Turn Bay Length (ft)	225		150	225		150	250		200	250		
Base Capacity (vph)	458	357	471	347	356	527	220	1425	787	506	870	848

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.59	0.67	0.44	0.56	0.55	0.91	0.50	0.36	0.32	0.62	0.94	0.26

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.94
Intersection Signal Delay: 30.7 Intersection LOS: C
Intersection Capacity Utilization 80.2% ICU Level of Service D
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: Elm Point Ind & Elm Street



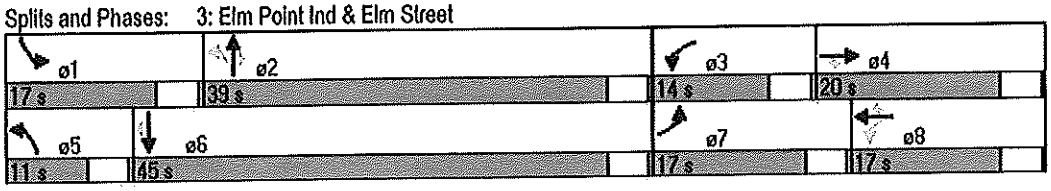
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	250	220	190	180	180	440	100	475	230	290	750	200
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	225		150	225		150	250		200	250		0
Storage Lanes	2		1	1		1	1		1	2		1
Taper Length (ft)	25		25	25		25	25		25	25		25
Satd. Flow (prot)	3433	1863	1583	1770	1863	1583	1770	3539	1583	3433	1863	1583
Flt Permitted	0.950			0.358			0.108			0.950		
Satd. Flow (perm)	3433	1863	1583	667	1863	1583	201	3539	1583	3433	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			207			323			250			215
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		865			940			707			546	
Travel Time (s)		19.7			21.4			16.1			12.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	272	239	207	196	196	478	109	516	250	315	815	217
Turn Type	Prot		Perm	pm+pt		Perm	pm+pt		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4	8		8	2		2			6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	10.0	10.0	7.0	10.0	10.0
Minimum Split (s)	11.0	21.0	21.0	11.0	20.0	20.0	11.0	20.0	20.0	11.0	20.0	20.0
Total Split (s)	17.0	20.0	20.0	14.0	17.0	17.0	11.0	39.0	39.0	17.0	45.0	45.0
Total Split (%)	18.9%	22.2%	22.2%	15.6%	18.9%	18.9%	12.2%	43.3%	43.3%	18.9%	50.0%	50.0%
Maximum Green (s)	13.0	16.0	16.0	10.0	13.0	13.0	7.0	35.0	35.0	13.0	41.0	41.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)	11.7	15.1	15.1	22.9	13.2	13.2	44.0	37.0	37.0	12.1	44.3	44.3
Actuated g/C Ratio	0.13	0.17	0.17	0.25	0.15	0.15	0.49	0.41	0.41	0.13	0.49	0.49
v/c Ratio	0.61	0.76	0.47	0.68	0.72	0.94	0.50	0.35	0.31	0.68	0.89	0.24
Control Delay	43.0	52.5	8.8	36.7	52.8	42.1	20.2	19.7	3.7	45.0	36.3	3.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	43.0	52.5	8.8	36.7	52.8	42.1	20.2	19.7	3.7	45.0	36.3	3.0
LOS	D	D	A	D	D	D	C	B	A	D	D	A
Approach Delay		36.3			43.3			15.2			32.9	
Approach LOS		D			D			B			C	
Queue Length 50th (ft)	75	129	0	83	107	89	26	108	0	88	433	1
Queue Length 95th (ft)	114	#232	58	#150	#207	#288	61	150	45	131	#689	38
Internal Link Dist (ft)		785			860			627			466	
Turn Bay Length (ft)	225		150	225		150	250		200	250		
Base Capacity (vph)	496	331	452	294	280	512	220	1454	798	496	918	889

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.55	0.72	0.46	0.67	0.70	0.93	0.50	0.35	0.31	0.64	0.89	0.24

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.94
Intersection Signal Delay: 31.9 Intersection LOS: C
Intersection Capacity Utilization 80.2% ICU Level of Service D
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: Elm Point Ind & Elm Street



Appendix C: SIDRA Outputs

INTERSECTION SUMMARY

Site: AM

Elm Point
Roundabout

Intersection Performance - Hourly Values		
Performance Measure	Vehicles	Persons
Demand Flows (Total)	3250 veh/h	3900 pers/h
Percent Heavy Vehicles	2.0 %	
Degree of Saturation	0.961	
Practical Spare Capacity	-11.6 %	
Effective Intersection Capacity	3381 veh/h	
Control Delay (Total)	19.82 veh-h/h	23.78 pers-h/h
Control Delay (Average)	21.9 sec	21.9 sec
Control Delay (Worst Lane)	37.0 sec	
Control Delay (Worst Movement)	42.5 sec	42.5 sec
Level of Service (Aver. Int. Delay)	LOS C	
Level of Service (Worst Movement)	LOS D	
Level of Service (Worst Lane)	LOS D	
95% Back of Queue - Vehicles (Worst Lane)	19.5 veh	
95% Back of Queue - Distance (Worst Lane)	495.4 ft	
Total Effective Stops	3791 veh/h	4549 pers/h
Effective Stop Rate	1.17 per veh	1.17 per pers
Proportion Queued	0.86	0.86
Performance Index	95.0	95.0
Travel Distance (Total)	1274.8 veh-mi/h	1529.7 pers-mi/h
Travel Distance (Average)	2071 ft	2071 ft
Travel Time (Total)	51.8 veh-h/h	62.1 pers-h/h
Travel Time (Average)	57.4 sec	57.4 sec
Travel Speed	24.6 mph	24.6 mph
Cost (Total)	840.06 $/h	840.06 $/h
Fuel Consumption (Total)	71.7 gal/h	
Carbon Dioxide (Total)	679.2 kg/h	
Hydrocarbons (Total)	1.150 kg/h	
Carbon Monoxide (Total)	55.61 kg/h	
NOx (Total)	1.671 kg/h	

LOS (Aver. Int. Delay) for Vehicles is based on average delay for all vehicle movements. LOS Method: Delay (HCM).
LOS Method for individual vehicle movements and lanes: Delay (HCM).
Roundabout LOS Method: Same as Signalised Intersections.
Roundabout Capacity Model: SIDRA Standard.

Intersection Performance - Annual Values		
Performance Measure	Vehicles	Persons
Demand Flows (Total)	1,560,000 veh/y	1,872,000 pers/y
Delay	9,511 veh-h/y	11,414 pers-h/y
Effective Stops	1,819,526 veh/y	2,183,432 pers/y
Travel Distance	611,895 veh-mi/y	734,274 pers-mi/y
Travel Time	24,860 veh-h/y	29,832 pers-h/y
Cost	403,227 $/y	403,227 $/y
Fuel Consumption	34,421 gal/y	
Carbon Dioxide	326,001 kg/y	
Hydrocarbons	552 kg/y	
Carbon Monoxide	26,692 kg/y	
NOx	802 kg/y	

MOVEMENT SUMMARY

Site: AM

Elm Point
Roundabout

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Elm S Leg											
3L	L	163	2.0	0.959	42.5	LOS D	18.7	474.3	1.00	1.58	19.2
8T	T	674	2.0	0.961	34.3	LOS C	19.5	495.4	1.00	1.58	19.8
8R	R	348	2.0	0.961	34.9	LOS C	19.5	495.4	1.00	1.59	20.0
Approach		1185	2.0	0.961	35.6	LOS D	19.5	495.4	1.00	1.58	19.8
East: Elm Point Industrial ELeg											
1L	L	163	2.0	0.582	23.1	LOS C	4.9	124.0	0.90	1.08	25.1
6T	T	196	2.0	0.582	14.9	LOS B	5.1	129.9	0.90	1.03	27.3
6R	R	185	2.0	0.581	15.8	LOS B	5.1	129.9	0.91	1.05	27.6
Approach		543	2.0	0.582	17.7	LOS C	5.1	129.9	0.90	1.05	26.7
North: Elm N Leg											
7L	L	391	2.0	0.507	15.9	LOS B	4.1	104.3	0.70	0.91	28.2
4T	T	326	2.0	0.507	8.1	LOS A	4.1	104.6	0.70	0.73	31.1
4R	R	130	2.0	0.508	9.5	LOS A	4.1	104.6	0.70	0.82	31.2
Approach		848	2.0	0.507	11.9	LOS B	4.1	104.6	0.70	0.83	29.6
West: Elm Point Industrial W Leg											
5L	L	326	2.0	0.510	18.0	LOS B	3.8	97.1	0.78	0.99	27.1
2T	T	239	2.0	0.510	9.8	LOS A	3.9	98.8	0.78	0.90	30.8
2R	R	109	2.0	0.510	11.2	LOS B	3.9	98.8	0.78	0.95	30.6
Approach		674	2.0	0.510	14.0	LOS B	3.9	98.8	0.78	0.95	28.8
All Vehicles		3250	2.0	0.961	21.9	LOS C	19.5	495.4	0.86	1.17	24.6

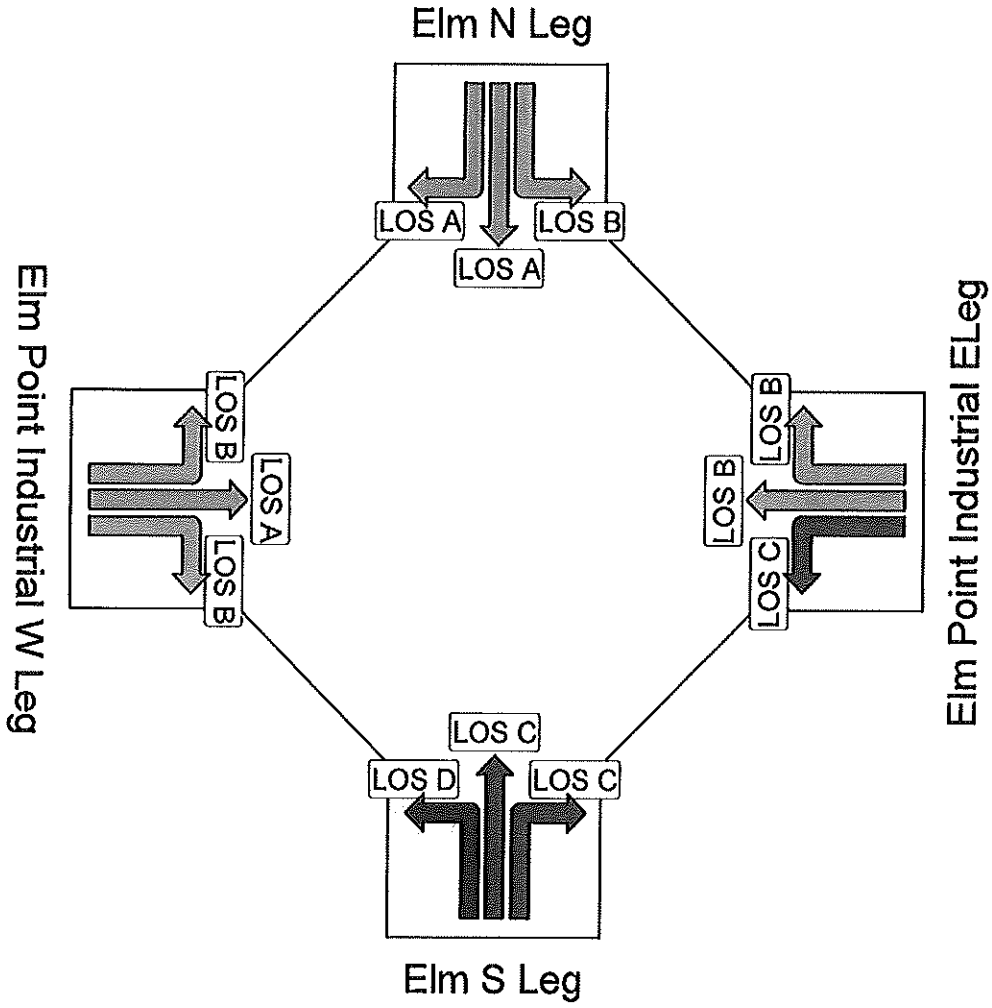
Level of Service (Aver. Int. Delay): LOS C. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS D. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on the worst delay for any vehicle movement.
Roundabout LOS Method: Same as Signalised Intersections.
Roundabout Capacity Model: SIDRA Standard.

LEVEL OF SERVICE

Site: AM

Level of Service Method: Delay (HCM)

Elm Point
Roundabout



Colour code based on Level of Service

LOS A | LOS B | LOS C | LOS D | LOS E | LOS F | Continuous

Roundabout Level of Service Method used in this display: Same as Signalised Intersections

SIDRA INTERSECTION

INTERSECTION SUMMARY

Site: PM

Elm Point
Roundabout

Intersection Performance - Hourly Values		
Performance Measure	Vehicles	Persons
Demand Flows (Total)	3810 veh/h	4572 pers/h
Percent Heavy Vehicles	2.0 %	
Degree of Saturation	0.870	
Practical Spare Capacity	-2.3 %	
Effective Intersection Capacity	4381 veh/h	
Control Delay (Total)	20.27 veh-h/h	24.32 pers-h/h
Control Delay (Average)	19.2 sec	19.2 sec
Control Delay (Worst Lane)	34.3 sec	
Control Delay (Worst Movement)	35.7 sec	35.7 sec
Level of Service (Aver. Int. Delay)	LOS B	
Level of Service (Worst Movement)	LOS D	
Level of Service (Worst Lane)	LOS C	
95% Back of Queue - Vehicles (Worst Lane)	13.8 veh	
95% Back of Queue - Distance (Worst Lane)	350.7 ft	
Total Effective Stops	4370 veh/h	5244 pers/h
Effective Stop Rate	1.15 per veh	1.15 per pers
Proportion Queued	0.94	0.94
Performance Index	107.5	107.5
Travel Distance (Total)	1482.1 veh-mi/h	1778.6 pers-mi/h
Travel Distance (Average)	2054 ft	2054 ft
Travel Time (Total)	57.3 veh-h/h	68.7 pers-h/h
Travel Time (Average)	54.1 sec	54.1 sec
Travel Speed	25.9 mph	25.9 mph
Cost (Total)	947.04 $/h	947.04 $/h
Fuel Consumption (Total)	82.9 gal/h	
Carbon Dioxide (Total)	785.3 kg/h	
Hydrocarbons (Total)	1.324 kg/h	
Carbon Monoxide (Total)	65.35 kg/h	
NOx (Total)	1.963 kg/h	

LOS (Aver. Int. Delay) for Vehicles is based on average delay for all vehicle movements. LOS Method: Delay (HCM).
LOS Method for individual vehicle movements and lanes: Delay (HCM).
Roundabout LOS Method: Same as Signalised Intersections.
Roundabout Capacity Model: SIDRA Standard.

Intersection Performance - Annual Values		
Performance Measure	Vehicles	Persons
Demand Flows (Total)	1,828,696 veh/y	2,194,435 pers/y
Delay	9,730 veh-h/y	11,676 pers-h/y
Effective Stops	2,097,782 veh/y	2,517,339 pers/y
Travel Distance	711,424 veh-mi/y	853,709 pers-mi/y
Travel Time	27,486 veh-h/y	32,984 pers-h/y
Cost	454,577 $/y	454,577 $/y
Fuel Consumption	39,802 gal/y	
Carbon Dioxide	376,967 kg/y	
Hydrocarbons	636 kg/y	
Carbon Monoxide	31,367 kg/y	
NOx	942 kg/y	

MOVEMENT SUMMARY

Site: PM

Elm Point
Roundabout

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Elm S Leg											
3L	L	109	2.0	0.671	20.9	LOS C	6.6	168.8	0.88	1.11	26.5
8T	T	516	2.0	0.671	13.0	LOS B	6.8	172.5	0.88	1.04	28.7
8R	R	250	2.0	0.670	14.2	LOS B	6.8	172.5	0.88	1.06	28.6
Approach		875	2.0	0.670	14.3	LOS C	6.8	172.5	0.88	1.05	28.3
East: Elm Point Industrial ELeg											
1L	L	196	2.0	0.675	21.9	LOS C	6.5	165.1	0.88	1.11	25.8
6T	T	196	2.0	0.675	14.2	LOS B	8.4	212.3	0.88	1.05	27.7
6R	R	478	2.0	0.746	16.6	LOS B	8.4	212.3	0.92	1.13	26.9
Approach		870	2.0	0.746	17.3	LOS C	8.4	212.3	0.90	1.11	26.8
North: Elm N Leg											
7L	L	315	2.0	0.827	23.4	LOS C	13.7	348.5	0.99	1.17	25.2
4T	T	815	2.0	0.828	15.6	LOS B	13.8	350.7	0.99	1.16	27.1
4R	R	217	2.0	0.827	16.9	LOS B	13.8	350.7	0.99	1.16	27.2
Approach		1348	2.0	0.828	17.6	LOS C	13.8	350.7	0.99	1.16	26.6
West: Elm Point Industrial W Leg											
5L	L	272	2.0	0.868	35.7	LOS D	9.6	244.1	0.97	1.27	20.6
2T	T	239	2.0	0.870	26.4	LOS C	10.3	261.8	0.98	1.28	22.3
2R	R	207	2.0	0.868	27.3	LOS C	10.3	261.8	0.99	1.28	22.5
Approach		717	2.0	0.869	30.2	LOS D	10.3	261.8	0.98	1.28	21.6
All Vehicles		3810	2.0	0.870	19.2	LOS B	13.8	350.7	0.94	1.15	25.9

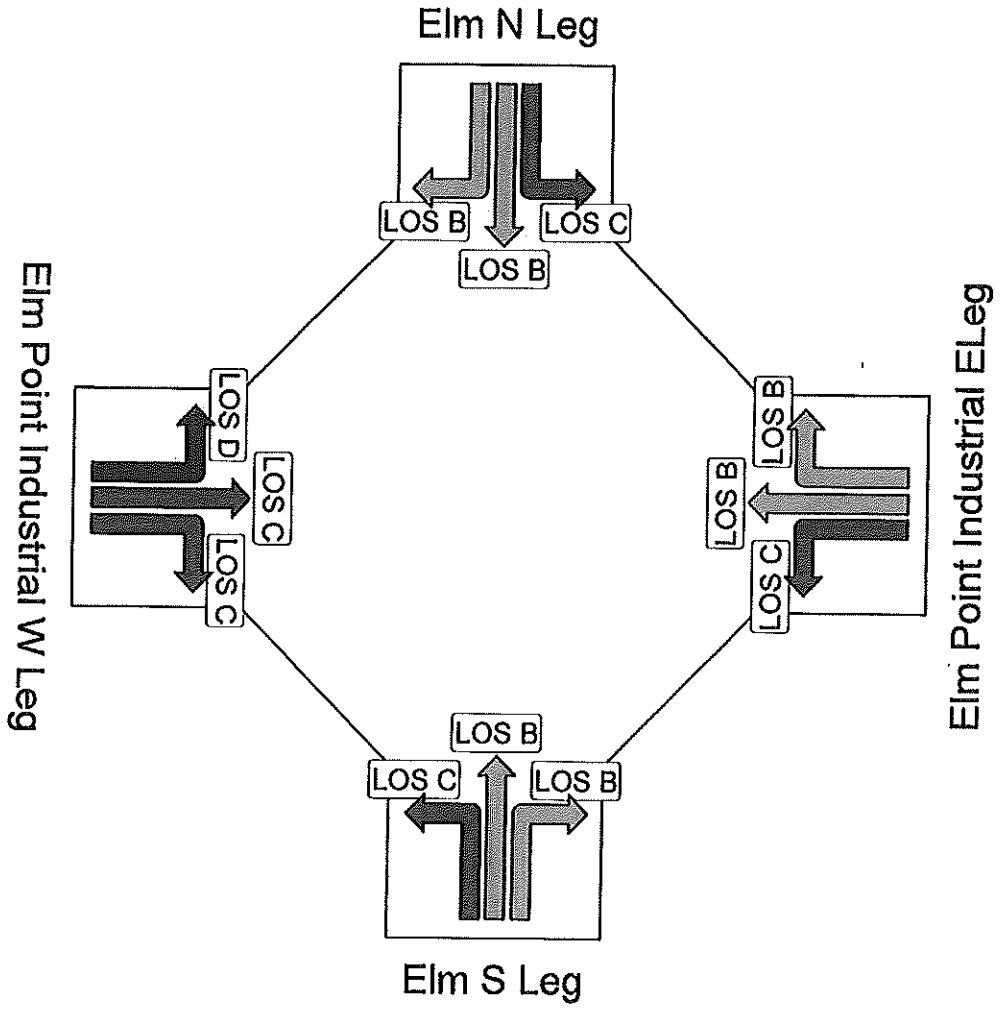
Level of Service (Aver. Int. Delay): LOS B. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS D. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on the worst delay for any vehicle movement.
Roundabout LOS Method: Same as Signalised Intersections.
Roundabout Capacity Model: SIDRA Standard.

LEVEL OF SERVICE

Level of Service Method: Delay (HCM)

Site: PM

Elm Point
Roundabout



Colour code based on Level of Service

LOS A	LOS B	LOS C	LOS D	LOS E	LOS F	Continuous

Roundabout Level of Service Method used in this display: Same as Signalised Intersections

SIDRA INTERSECTION

Data Requirements – FY14-FY15 CMAQ
Elm Street at Elm Point Industrial Drive

Average Delay Per Vehicle

AM Peak (after) – **24.3 sec**
AM Peak (present) – **41.1 sec**
PM Peak (after) – **30.7 sec**
PM Peak (present) – **30.6 sec**

These delay measurements consider the average delay of the intersection as a whole. Changes to the eastbound and northbound legs will allow for an overall increase in efficiency of the intersection.

Average Daily Traffic

Elm Point Industrial Drive, west of Elm Street (after) – **8,650 veh/day**
Elm Point Industrial Drive, west of Elm Street (present) – **8,650 veh/day**

Elm Point Industrial Drive, east of Elm Street (after) – **8,050 veh/day**
Elm Point Industrial Drive, west of Elm Street (present) – **8,050 veh/day**

Elm Street, south of Elm Point Industrial Drive (after) – **13,000 veh/day**
Elm Street, south of Elm Point Industrial Drive (present) – **13,000 veh/day**

Elm Street, north of Elm Point Industrial Drive (after) – **17,800 veh/day**
Elm Street, north of Elm Point Industrial Drive (present) – **17,800 veh/day**

The above ADT values represent that the initial travel demand is anticipated to be similar to existing. Increases to demand are projected to occur at a consistent rate of 1.5% per year, with periodic surges due to development of currently vacant land in the area of this project, causing a 50% increase on the north, south, and west legs, and a 125% increase on the eastern leg by year 2030.

Posted Speed Limit

Elm Point Industrial Drive - **35 mph**
Elm Street – **30 mph**

Project Length – 0.15 miles

Speed

Elm Point Industrial (after) – **35 mph**
Elm Point Industrial (present) – **35 mph**
Elm Street (after) – **30 mph**
Elm Street (present) – **30 mph**

Approach speeds to the intersection are assumed to be the speed limit for the respective roadways, which will not be changed as part of this project. This project is intended to reduce control delay, and not greatly affect average approach speeds.

Department of Public Works
Engineering Division

City of St. Charles
Consultant Selection Criteria
Project Name: Elm at Elm Point Traffic Flow Improvements

		Responsive Firms													
		Firm 1		Firm 2		Firm 3		Firm 4		Firm 5		Firm 6		Firm 7	
Criteria	Weight	Raw Score (1-5)	Weighted Score	Raw Score (1-5)	Weighted Score	Raw Score (1-5)	Weighted Score	Raw Score (1-5)	Weighted Score	Raw Score (1-5)	Weighted Score	Raw Score (1-5)	Weighted Score	Raw Score (1-5)	Weighted Score
Experience in work required	15%														
Record of the firm accomplishing the work on other projects in the required time	10%														
QA/QC Plan	5%														
Recent experience showing accuracy of construction project cost estimates	5%														
Community relations including evidence of sensitivity to citizen concerns	5%														
Consultant's thorough research and technical approach to the project	25%														
Proposal meets the City's time requirements / project schedule	15%														
Adequate staffing	10%														
Project Management Approach	10%														
TOTAL	100%														

Summary